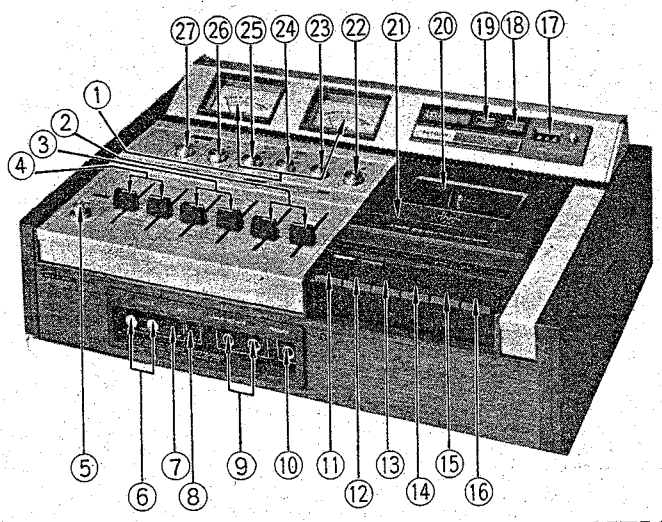
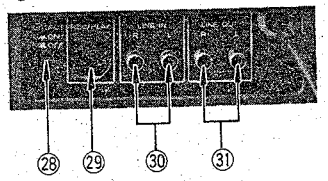
HITACHI D-3500BS, S

SERVICE MANUAL

No. 881



1. Level meter
2. Line recording level control
3. Mic recording level control
4. Output level control
5. Power switch
6. Dolby calibration control
7. Test signal button
8. MPX filter switch
9. Mic jack
10. Headphone jack
11. Stop/Eject
12. Recording
13. Playback



14. Rewind
15. Fast forward
16. Pause
17. Tape counter
18. Playback indicator
19. Recording indicator
20. Cassette lid
21. Head cover
22. Meter selector switch
23. Memory counter switch
24. Tape selector switch
25. Dolby switch
26. Input selector switch
27. Monitor switch
28. Output switch
29. Din jack
30. Line in jack
31. Line out jack

SPECIFICATIONS

※ MEASURED ACCORDING TO DIN 45500.

ITEM	D-3500BS	D-3500S※
Power source	AC240V, 50Hz	AC220V, 50Hz
Power consumption	18W	20W
IC	16	
Transistor	27 (include FET)	
Diode	30	
Thermister	2	
Tape speed	4.75cm/s	
Cassette used	C–60, C–90	
Recording system	4-track 2-channel AC bias system	
Recording bias oscillation frequency	105 kHz	
Erasing system	AC erase	
Playback compensation time constant	Normal/UD: 120μs CrO2: 70μs	
Head used	Record head | R & P combination (ferrite) Playback head | head: 1 Erase head (ferrite): 1	
Motor used	Phase control DC motor	
Frequency characteristics	Chrome tape: 20–20,000Hz Normal tape: 20–15,000Hz	Chrome tape: 20–20,000Hz Normal tape: 20–18,000Hz

ITEM	D-3500BS	D-3500S※
Wow & flutter	0.05% WRMS	0.15%
S/N	Dolby ON : 63dB Dolby OFF: 55dB	Dolby ON : 63dB Dolby OFF: 56dB
Distortion	2.0% (1kHz, 0dB)	
Erasing	65dB	
Cross-talk	60dB	
Input sensitivity	Line in: 35mV Mic : 0.18mV Din : 0.18mV	Line in: 70mV Mic : 0.8mV Din : 0.6mV
Input impedance	Line in: more than 100kΩ Mic: 300–20kΩ Din: 2kΩ	Line in: more than 100kΩ Mic: 300–20kΩ Din: 6.8kΩ
Output impedance	Line out: more than 50kΩ Headphone: 8–2kΩ Din: more than 50kΩ	
Output level	more than 0.5V	
Fast forward/rewind time	90 sec (C–60 used)	
Dimensions	43.0(W) × 14.0(H) × 28.3(D) cm	
Weight	7.0kg	

SAFETY PRECAUTION

The following precautions should be observed when servicing.

1. Since many parts in the unit have special safetyrelated characteristics, always use genuine Hitachi's replacement parts. Especially critical parts in the power circuit block should not be replaced with other makes. Critical parts are marked with ★ in the schematic diagram, and circuit board diagram.
2. Before returning a repaired unit to the customer, the service technician must thoroughly test the unit to ascertain that it is completely safe to operate without danger of electrical shock.

TECHNICAL EXPLANATION

1. Combined Recording/Playback head

The independent recording and playback heads are held in a single case ; this system has the following advantages.

1-1 Since there are independent recording and playback head, each with its own characteristics, low distortion, high sensitivity and good high frequency band characteristics can be obtained.

The object of the magnetic heads is for the recording head to record high level signals on the magnetic tape with minimum distortion so that a high level output can be obtained during playback ; the playback head must play the signals recorded on the tape back efficiently.

The reason why high quality open-reel tape decks have three heads (independent heads for erasing, recording and playback) is so that the performance of each head can be optimized.

Table 1 shows an example of the gap sections of the recording and playback heads of an open-reel tape deck. It is desirable that the heads are designed with the gap of the recording head near the magnetic coating of the tape and the gap of the playback head approximately 1/3 of the wavelength of the highest frequency recorded.

	Recording head	Playback head
Gap	12.7μ	2.5μ

Table 1

In calculating the gap widths of the recording and playback heads of a cassette tape recorder from the standpoint of optimizing distortion/sensitivity and frequency characteristics, the following points must be taken into consideration. Fig. 2 shows freguency/sensitivity characteristics of recording heads with different gaps. For the same freguency, the playback output level of signals recorded with the 1μ gap head is 2 dB greater than those recorded with the 2μ gap head.

Fig. 3 shows the recording frequency/sensitivity characteristics of the recording heads. When compared with signals recorded with the 1μ gap head, the output at 10kHz is

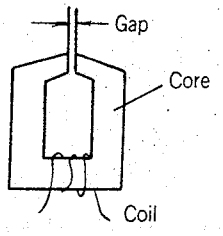


Fig. 1

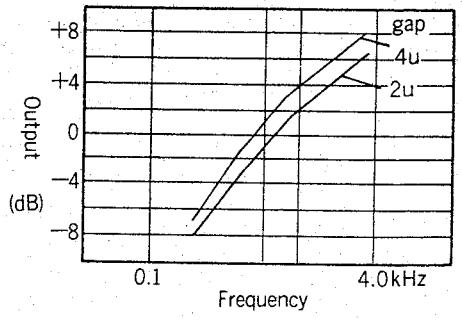


Fig. 2

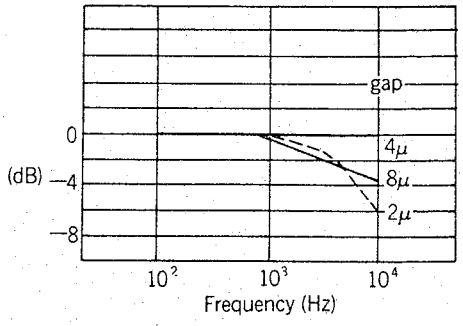


Fig. 3

1 dB down with a 8μ gap head and 6 dB down with a 2μ gap head, as can be seen from the diagram.

The gap width of the playback head determines the playback sensitivity and playback characteristics.

The wavelength of 10kHz signals recorded on cassette tape is 1.75μ so the gap width for optimum frequency characteristics is less than 1.5μ.

Distortion, sensitivity and frequency characteristics are optimized by making the gap of the recording head 1μ and that of the playback head 1.2μ, as described above.

1-2 Since both the recording and playback heads touch the cassette pad, wide frequency characteristics with small level fluctuations can be obtained.

The standards for the construction of cassettes specify 5 windows of different sizes and various combinations were considered. The system shown in Fig. 4 was adopted for the D-3500 to improve its characteristics as described below.

(1) Since the shield plate and pad are at the center window, the recording/playback heads are installed here to prevent induction and improve contact between the tape and head.

(2) The tape shifter is used to reduce level fluctuations and minimize wow and flutter. Frequency characteristics are improved by making tape contact better.

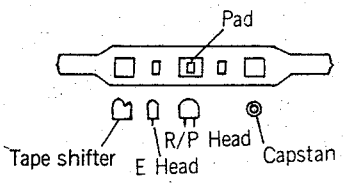


Fig. 4

1-3 Since ferrite cores are used, it is resistant to wear and good channel separation can be achieved.

The ferrite core has the following features :

(1) Resistance to wear is excellent and service life is long.

(2) High accuracy gaps can be manufactured, the playback head having a narrow 1.2μ glass gap.

(3) Since the head is a combination of recording/playback heads, the azimuth of the recording and playback heads cannot be adjusted independently, so the degree of parallel of the gaps and the accuracy of track width must be strictly controlled. By manufacturing heads with the gaps accurately parallel within 1μ/10mm, innacurate azimuth can be eliminated and channel separation improved.

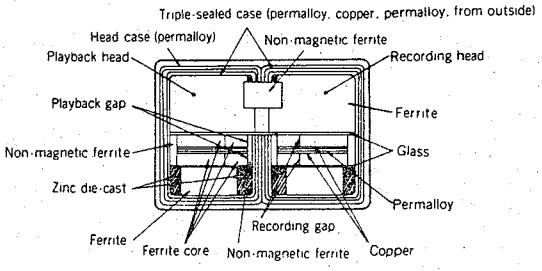


Fig. 5

1-4 By providing sufficient shielding, leakage of crossfeed signals from the recording to playback head can be reduced to less than the noise level.

Magnetic flux from the recording head not only passes through the tape but also leaks to the playback head. When this magnetic flux is at a high level, the signals picked up from the tape and magnetic flux leaking from the recording head are accumulated, so the output from the playback head is accompanied by noise.

This leakage of flux is called croos-feed and must be limited to 50 dB down, less than the noise level.

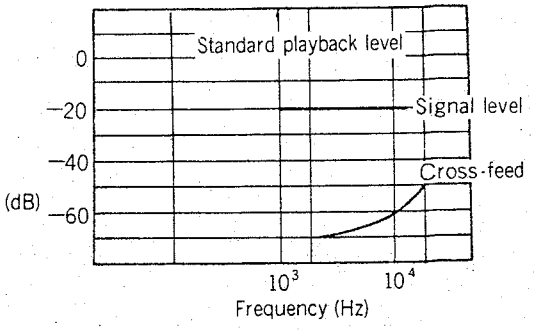


Fig. 6

For this reason, the recording and playback heads are enclosed in the three layer shielding case – permalloy-copper-permalloy – shown in Fig. 5, so that playback output resulting from cross-feed is at the same or a lower level than noise.

2. TAPE SHIFTER AND TAPE GUIDE

With only the narrow pad built into the cassette providing uneven pressure, this is insufficient to obtain the constant and stable tape contact required by the combined recording/playback head. It is necessary to apply tension to the tape so that stable contact is made with the head surface. One method in which this is done is by providing the suppling turntable with back tension ; however, this causes the wow and fluuter to deteriorate in proportion to the tension applied as shown in Fig. 7. (A back tension of 20～25gr-cm is necessary in the D-3500.)

Applying back-tension to the guide roller and the tape after the roller is sufficient to prevent the deterioration of the wow and flutter, lessening the influences of irregularities in the turn table, guide roller, etc.

To perform this, the newly developed Tape Shifter shown in Fig. 8 is used.

As shown in Fig. 9, back-tension against the head is given by

$T=To\,e^{\Sigma\mu\theta}$

μ : Friction

θ : Azimuth of tape and tape guide

To : Tape tension before tape shifter

The back-tension of the cassette spool itself (1－2g-cm), is amplified to a tape tension of 20～25gr-cm against the head. In this way, the influence of cassette irregularities is eliminated and stable contact between the head surface and tape is achieved by the tesion of the roller. In addition, the groove in the Tape Guide absorbs irregularities in the tape running height, which is a result of the slight difference between cassettes. Thus, the contact between the tape and the erase and combination recording/playback heads is stable.

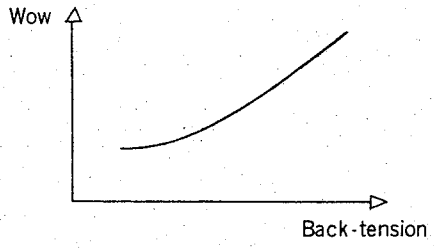


Fig. 7

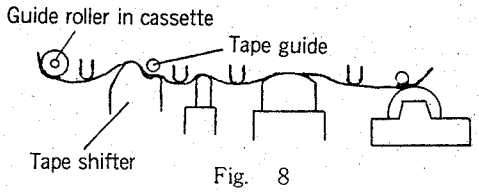


Fig. 8

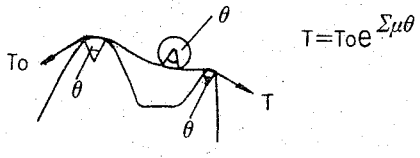


Fig. 9

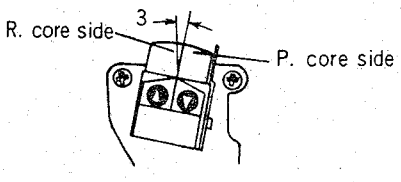


Fig. 10

Note : Some cassettes available have smaller pads. When such a cassette is used, if the R/P head is at right angles to the tape, the pad will be inclined to the play core and the tape pressure on the recording core will deteriorate.

To prevent this, the R/P head is installed inclined at 3° to the tape running direction, to ensure improved tape pressure against the recording core with all tapes available.

3. Full Auto-stop

The Auto-stop mechanism ensures that the stop mode is entered when the end of tape is reached in all modes-playback, recording, fast-forward and rewind.

(1) Pulley (1) which is the same unit as the worm gear rotated by the T-pulley, rotates and drives the cylindrical cam and its worm gear in the direction of the arrow. (a), (b), (c)

(2) Pulley (2) is driven by the belt from the take-up turntable. (d)

(3) The stopper is held at the lower part of pulley (2) by the weak force of the slip mechanism. The pin at the tip of the stopper is kept in the groove of the cylindrical cam, and as the cam rotates, it is turned in the groove.

(4) When the tape is running during recording, playback and fast-forward, pulley (2) rotates counterclockwise and the pin at the tip of the stopper also rotates counterclockwise with a slight force ; the pin moves along the surface inside the groove of the cylindrical cam. In the rewind mode, pulley (2) rotates counterclockwise and the stopper rotates clockwise. (e)

(5) When the tape stops in the condition described in (4), the rotation of the take-up turn table stops ; since a force causing the tip of the stopper to rotate is not applied, it is pushed straight forward (it does not deviate as the groove is narrow) and is caught by the projection in the groove, whereupon the rotation of the cylindrical cam stops. (f)

(6) Since the worm gear shaft continues to rotate, when the cylindrical cam and worm gear stop, the worm gear shaft drops in the direction of the arrow. (g)

(7) When the worm gear shaft drops it presses the eject lever in the direction of the arrow. (h)

(8) The eject lever rotates around its fulcrum in the direction of the arrow. (i)

(9) The revolution of the eject lever cause the lock slider and lock-off piece to move in the direction of the arrow. (j) (k)

(10) When the lock piece moves, it is kicked in the direction of the arrow by the projecting portion of the flywheel and the lock plate locking the button moves in the direction of the arrow, the button is unlocked and the machine enters the stop mode. (e) (m)

During the PAUSE and STOP modes, the cam is positioned so that the pin of the stopper does not come into contact with the projecting part of the cylindrical cam so that the auto-stop mechanism does not function.

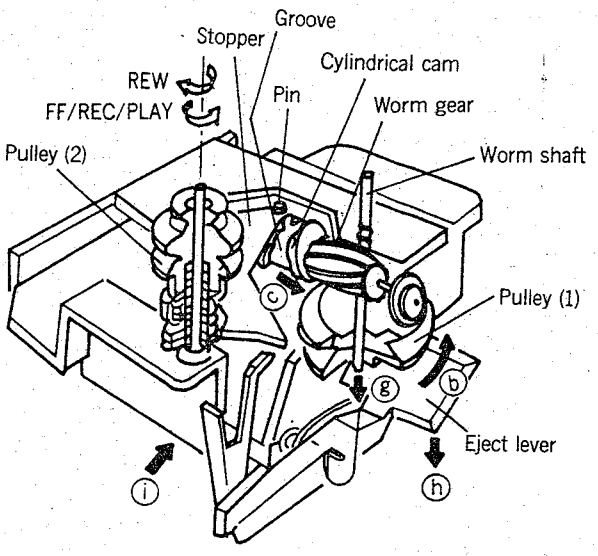


Fig. 11

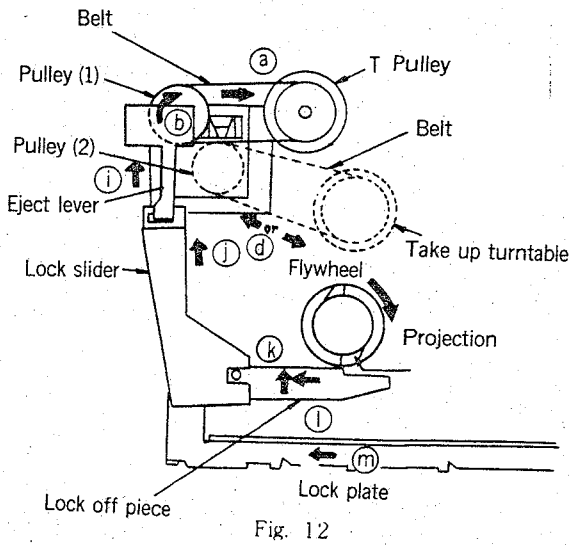


Fig. 12

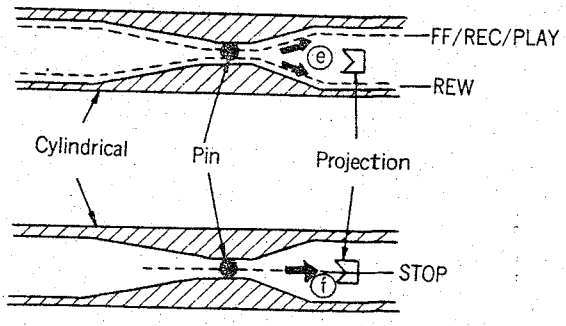


Fig. 13

4. Memory Counter

When the tape is rewound to the beginning of the recording with the memory counter switch (S10-1) set to ON and the tape counter having been reset to 000 before recording or playback, when 999 is indicated by the tape counter, switch S13 inside the counter turns ON, Q502 starts operation, current flows to the solenoid and the mechanism stops.

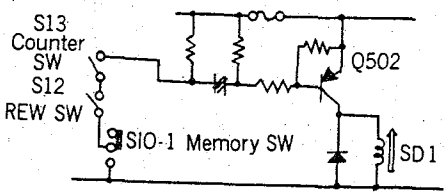


Fig. 14

5. CrO_2 cassette automatic changeover (S15)

Some cassettes containing chrome tape have CrO_2 detection holes as shown in Fig. 15. when this kind of cassette is loaded, micro-switch S15 is turned OFF, automatically switching on-line the recording/playback equalizer, recording bias and sensitivity for best use of chrome tape.

When a normal cassette is loaded, this hole is not detected and the switch is turned ON.

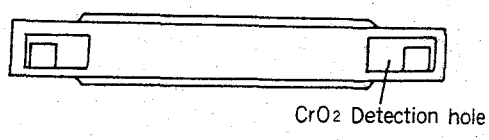


Fig. 15

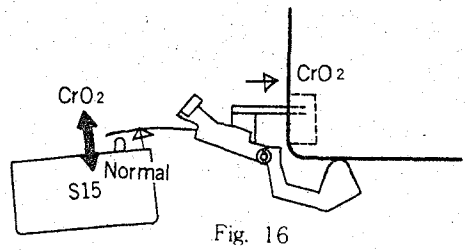


Fig. 16

Explanation of CrO_2 circuit

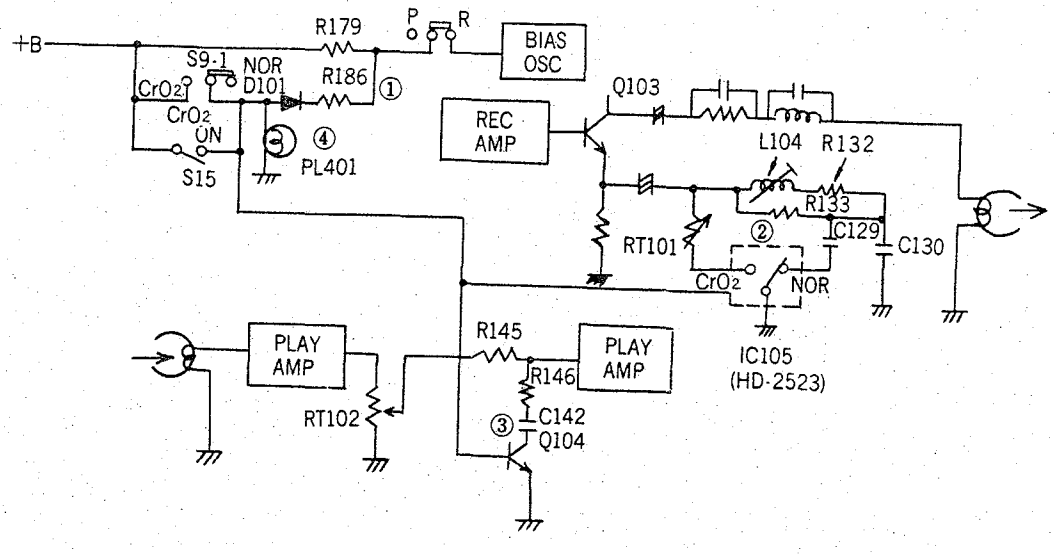


Fig. 17

(1) Bias current

To make the best use of chrome tape, a higher bias current is required than in the case of normal tape. Accordingly, R186 is inserted between +B and the bias circuit to increase the voltage supplied to the bias circuit when chrome tape is being used, thus increasing the bias current.

(2) Recording equalizer and sensitivity

When using chrome tape switched over to CrO_2, power is applied to the digital IC, changing over the recording equalizer and senitivity. In the CrO_2 position, RT101 is inserted to increase sensitivity.

(3) Playback equalizer

When chrome tape is used, Q104 operates to compensate for the changed time constants (Normal tape ; 120μs, chrome tape ; 70μs) via R146 and C142.

6. Level meter circuit

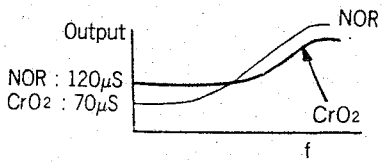
Fig. 18 shows a level meter which is not a peak level meter but which indicates Ia (average value). It is a combination of a variable coil ammeter and diodes.

With this type of meter, the level of the input signal which detends on the head, tape, etc. is determined by the circuit and it is clipped when the point at which it exceeds the satuaration level is shown. For pulse inputs with a wide dynamic range, the meter must show the peak value reached by the top section of the wave without clipping if the saturation level is not to be exceeded.

Fig. 20 shows a circuit which will indicate the peak value. Input ei is rectified and charges C. This discharges through the meter circuit with Ro and the current I_2, shown in Fig. 20, flows. When rectification is performed in this circuit with a time constant of Ri : C $\fallingdotseq$ 0, RoC $\gg$ meter response time, and the peak value of the input waveform shown in Fig. 19 is indicated. Fig. 22 shows the response time of the meter ; with a VU meter, the time required for a 90% indication is 300ms and the input current must be present for more than 300ms. However, the meter used in the D-3500 has a shorter response time, giving a 90% indication within 50ms.

(4) Indication lamp

PL401 is turned on when chrome tape is used. D101 is provided to prevent it lighting when normal tape is used.



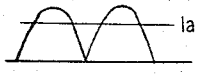
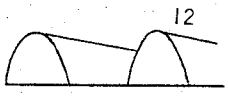


Fig. 18



.Fig. 19

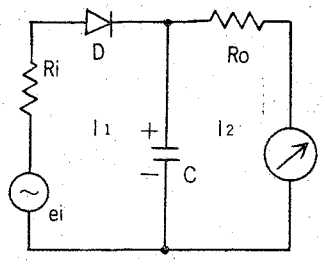


Fig. 20

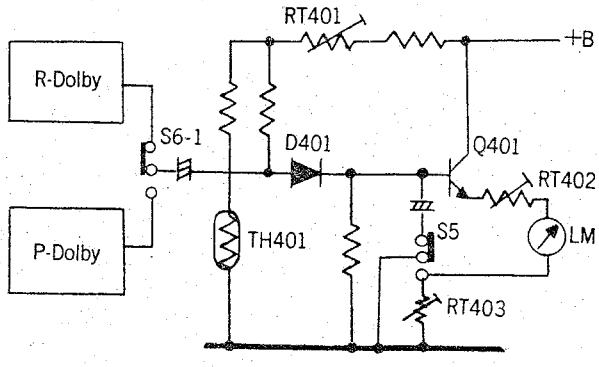


Fig. 21

Operation of each component shown in Fig. 21 is as follows.

1. Q401 is an emitter follower : it increases the input the impedance and discharging time constant.
2. RT 101 is a bias adjustment resistor, acting line on D401.
3. RT402 is a meter correction resistor when used as a VU meter.
4. RT403 is a meter correction resistor when used as a peak level meter.

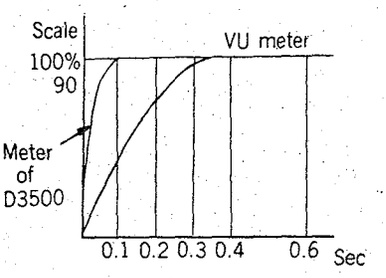


Fig. 22

7. Dolby Circuit

The Dolby noise reduction circuit can cut tape noise, improving the Signal-to-Noise ratio by up to about 10 dB without causing the frequency characteristics to deteriorate. Since the D-3500 is a 3-head deck, with independent recording and playback heads and amplifiers, two Dobly circuits are incorporated, for recording and playback. When monitoring during recording, monitoring of the signal after it has been processed by the Dolby circuit is possible.

Dolby operates by varying the gain at high frequencies, reducing noise and playing back Dolbyized tapes with a flat frequency response. However, since different kinds of tapes have different sensitivities, the flat frequency characteristic shown in Fig. 23 cannot normally be achieved. To prevent this unbalance, the sensitivity can be matched by using the built-in oscillator.

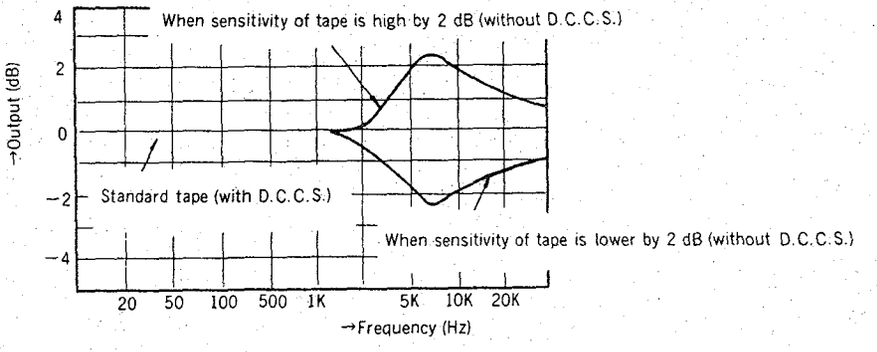


Fig. 23

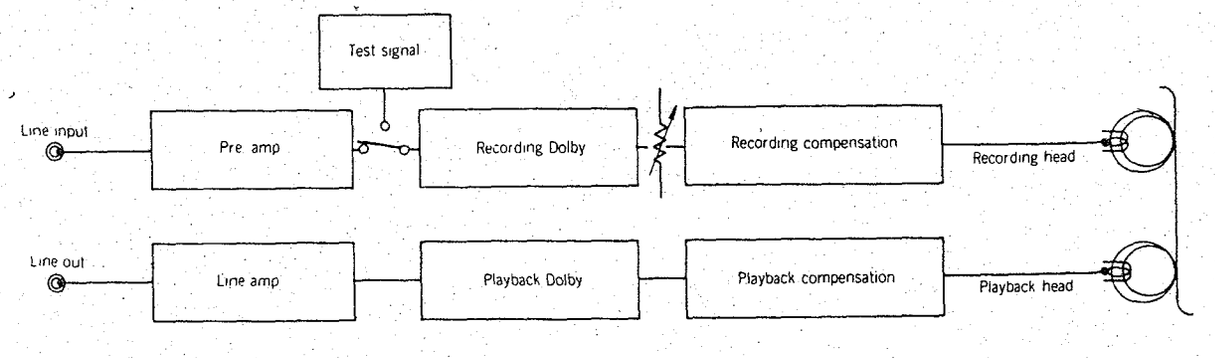


Fig. 24

8. TAPE/SOURCE Monitor (S6)

TAPE monitoring (monitoring the signal recorded on the tape) is possible as the D-3500 is a 3-head tape deck with independent recording, playback and erase heads.

NOTE:

Models for General and Australia have to be used with the PLAY and PAUSE buttons depressed, to monitor "source sound" prior to starting the tape. No sound willbe heard if monitoring is done in STOP mode.

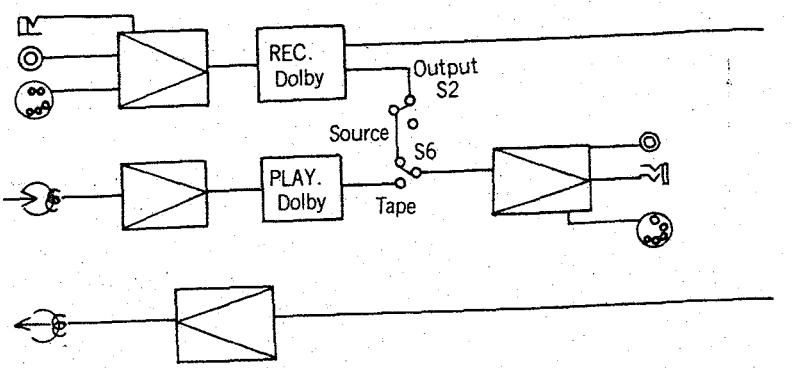


Fig. 25

9. Output switch (S2)

When connected to a stereo system using a DIN cord, oscillations may occur, so a switch is provided to turn off the output if this occurs. Abnormal oscillations occur during recording as a result of loops (1) and (2) shown in Fig. 26. To prevent this, output is cut by switch S2 when recording.

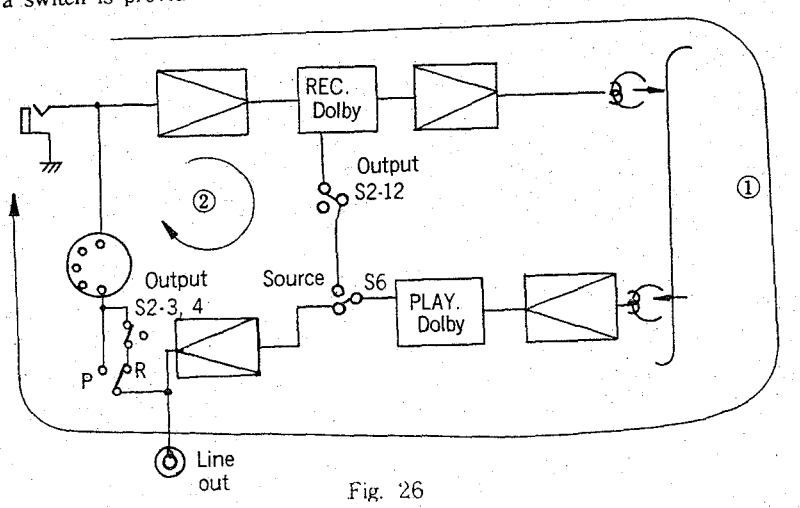


Fig. 26

10. Input selector (S7)

Select MIC and LINE inputs with S7.

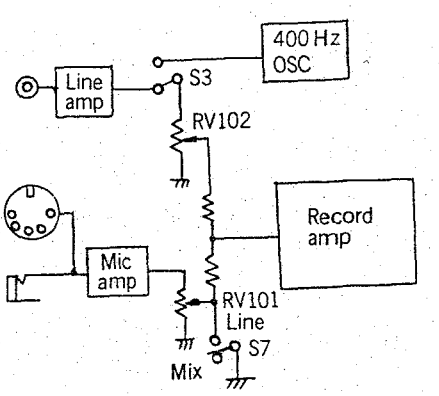


Fig. 27

11. MPX filter (S4)

The amount of compensation provided by the Dolby circuit varies with the input level. However, when the MPX separation signal leaks in FM stereo, correct compensation cannot be achieved.

To prevent this, it is necessary to provide an FM MPX filter to remove the 19kHz pilot signal and 38kHz subcarrier during Dolbyized recording.

Note: The filter is inserted when S4 is ON, so the frequency characteristic is no more than with the MPX filter switched OFF

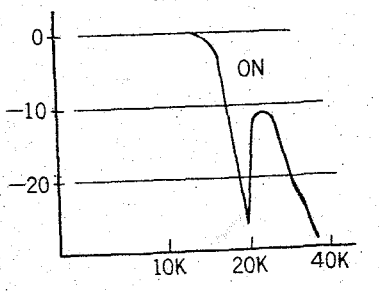


Fig. 28

DISASSEMBLY PROCEDURE FOR ALIGNMENT AND PART REPLACEMENT

Numerals in ◯ indicated on Fig. 29 and 30 show ones of Disassembly procedure.

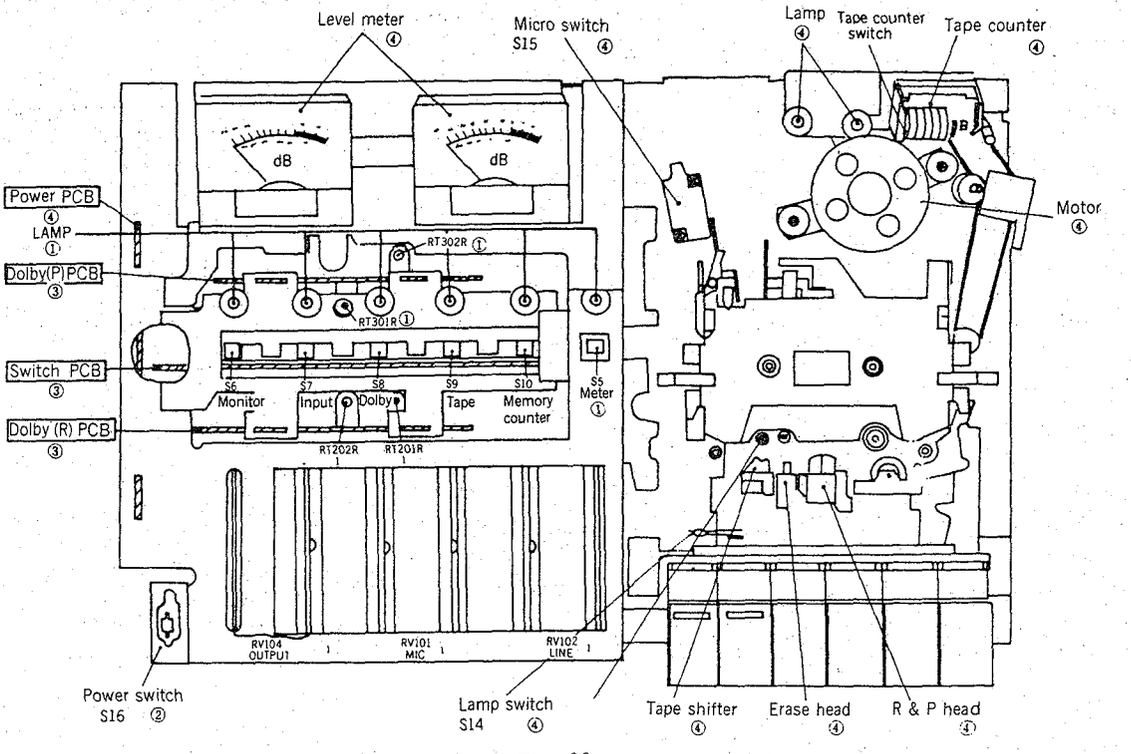


Fig. 29

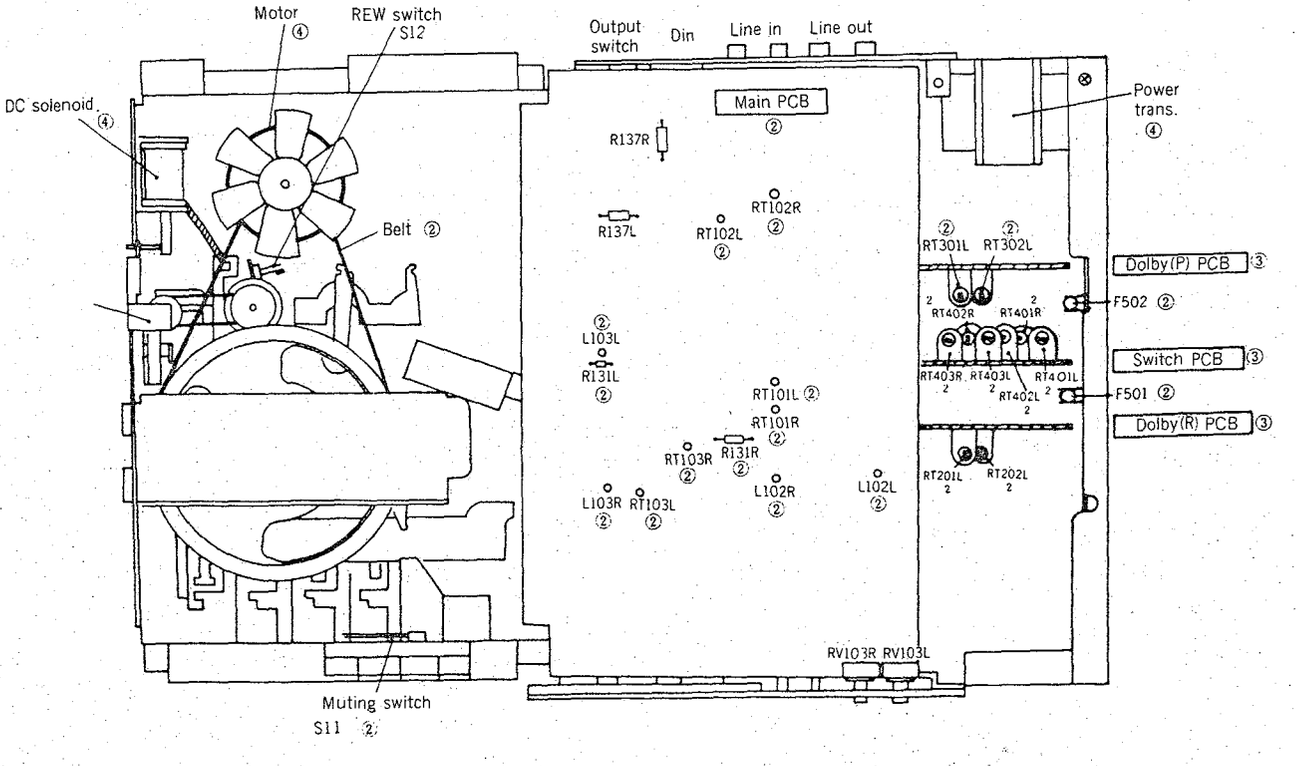
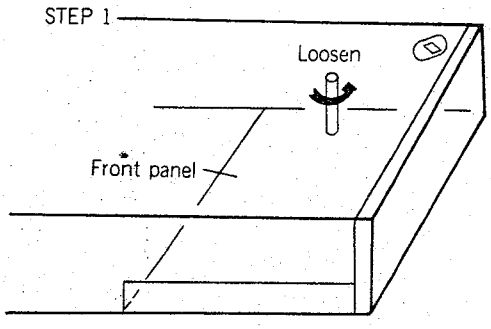


Fig. 30

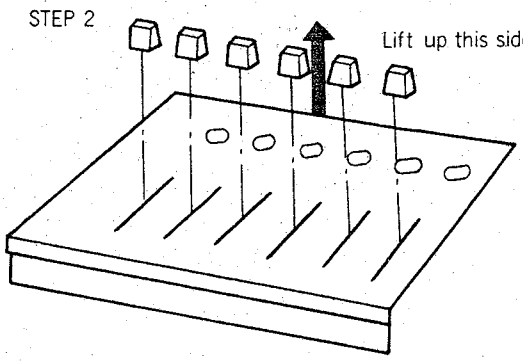
Disassembly procedure

① Front panel

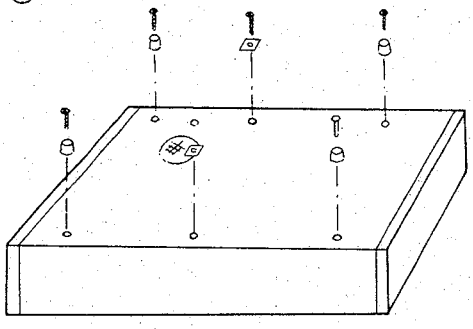
STEP 1



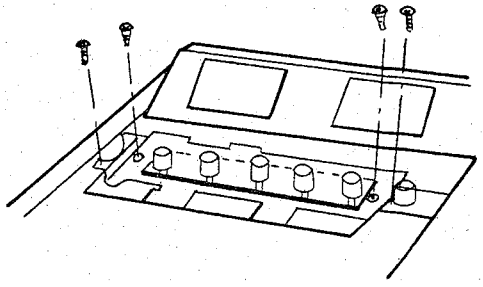
STEP 2



② Bottom plate

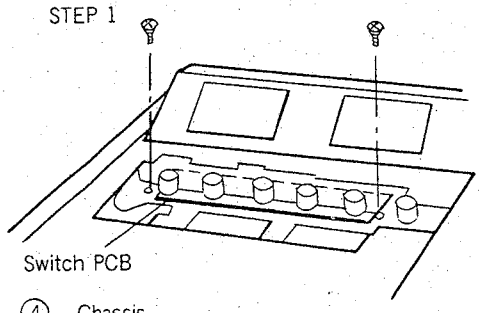


Lamp and Meter SW replacement

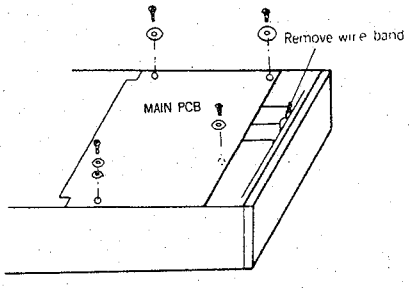


③ MAIN PCB with Dolby and Switch PCB

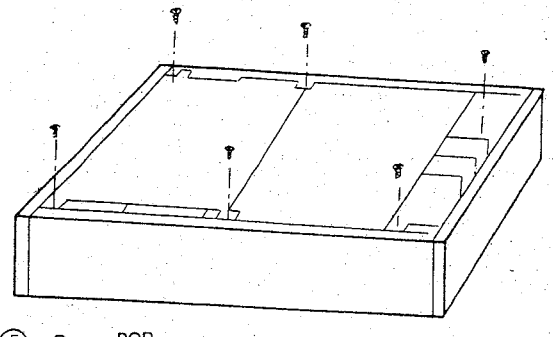
STEP 1



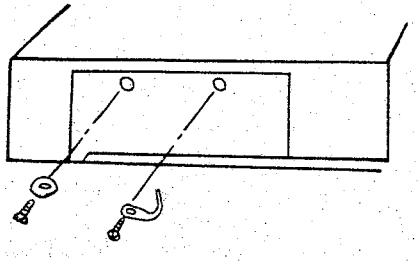
STEP 2



④ Chassis

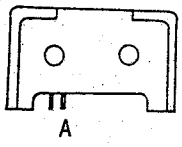


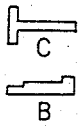
⑤ Power PCB

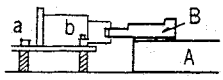
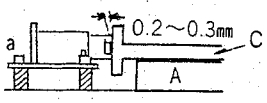
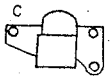
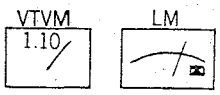
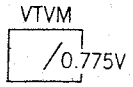
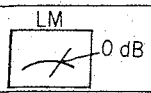
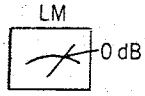


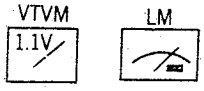
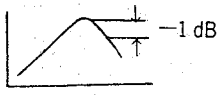
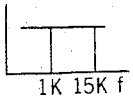
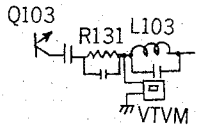
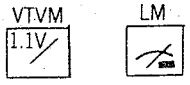
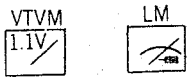
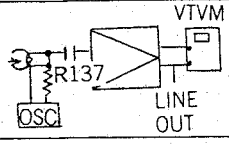
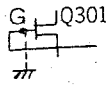
ELECTRICAL ADJUSTMENT

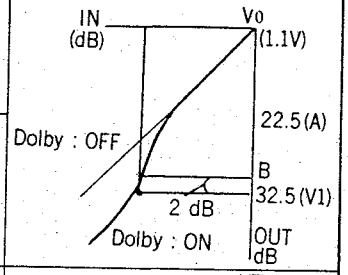
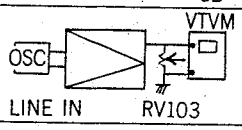
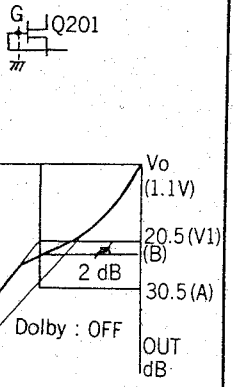
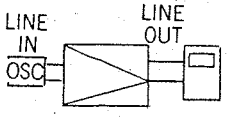
Special tools are necessary to perform the head adjustment shown in item 1. When adjustment is necessary, consult your nearest HITACHI OFFICE



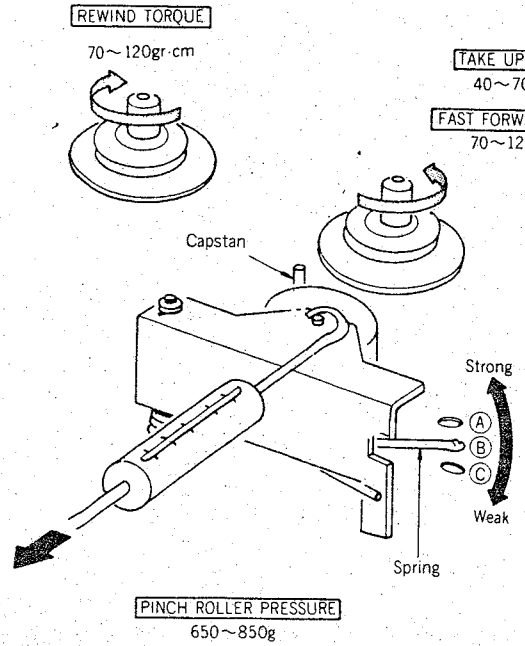


	Item	Instrument	Playback/ Recording	Switch pos'n	Adjust part	Method	Remarks
1.	R/P head						
	1-1 height	Tools A & B	Play	—	Screws a & b	Slide tools B to match head guide	
	1-2 gate	Tools A & C	Play	—	Screw a	Gap between tool C & upper surface of head 0.2–0.3㎜	
	1-3 azimuth	Azimuth standard tape	Play	NORMAL	Screw c	Maximize output	
2.	Playback amp. gain	Standard gain tape (Dolby tape (20m Maxwell) VTVM	Play	NORMAL	RT102	Output should be 1.1V	
3.	Level meter						
	3-1 Zero	—	—	Meter : VU	RT401	Remove all inputs Adjust RT401 so pointer indicates zero	
	3-2 VU	—	—	Meter : VU Monitor : Source		Depress 400Hz Osc switch	
					RV102	LINE output must be 0.775V	
					RT402	LM must be 0dB	
	3-3 Peak	—	—	Meter : Peak Monitor : Source	RT403	As 3-2	

	Item	Instrument	Playback/ Recording	Switch pos'n	Adjust part	Method	Remarks
4.	Bias current	CrO_2 Tape VTVM Oscillator	Rec	Tape : CrO_2		Apply to LINE IN 1kHz input which is 1.1V output(LM) at LINE OUT	
				Monitor : TAPE	RT103	Playback output −1 dB from peak	
					RT103	Reduce input signal by 20 dB ; adjust so 1kHz and 15 kHz are played back at same level(±4 dB)	
5.	Bias leak	VTVM	Rec	—	L103	Connect VTVM between R131 & L103. Adjust to minimize VTVM reading	
6.	Recording amp gain						
	6-1 NORMAL	Normal tape VTVM Oscillator	Rec	Monitor : Tape and Source Tape : NOR		Apply 1kHz to LINE IN for LINE OUT of 1.1V	
					RV103	LINE OUT at both TAPE & SOURCE must be the same	
	6-2 CrO_2	New CrO_2 tape VTVM Oscillator		Monitor : Tape & Source Tape : CrO_2	RT101	As 6-1	
7.	Dolby						
	7-1 Playback	Oscillator VTVM	Play	Monitor : Tape		Apply 5kHz to R137, connect VTVM to LINE OUT	
					RT302	Turn up to max.	
						Ground Q301 (Gate). Drop input by 22.5 dB from that which gives a line output of 1.1V(Vo)	

	Item	Instrument	Playback/ Recording	Switch pos'n	Adjust part	Method	Remarks
				Dolby : ON Monitor : TAPE	RT301	Output must be 32.5 dB (V1) lower than Vo.	
					RT302	Remove Q301 ground. Adjust to raise 2 dB from V1 (B)	
	7-2Recording	Oscillator VTVM	Rec	Dolby : OFF		Apply 5 kHz signal to LINE IN, connect VTVM to RV103.	
					RT202	Turn up to max.	
						Ground Q201 (gate). Apply input signal so that VTVM reading is 1.1V (Vo). Drop input 30.5 dB from Vo (A)	
				Dolby : ON	RT201	Adjust to 20.5 dB below V0 (V1). Remove Q201 ground	
					RT202	Adjust to 2 dB down from V1 (B)	
8	MPX filter	Oscillator VTVM	Rec	MPX : ON	L102	Apply 19 kHz signal to LINE IN, connect VTVM to LINE OUT Minimum output	

MECHANICAL ADJUSTMENT



TURN TABLE TORQUE

1. Take up torque 40～70gr·cm (In PLAY mode)
2. Fast forward torque 70～120gr·cm (In F.F. mode)
3. Rewind torque 70～120gr·cm (In REW mode)

PINCH ROLLER PRESSURE

Adjust by changing the hooking position of the spring so that spring scale reads 650～850gr when the pinch roller departs from the capstan.

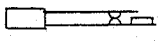
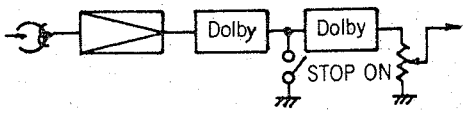
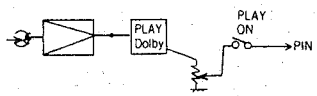
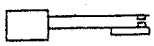
NOTE

To increase the pressure : hook the spring in hole Ⓐ
To reduce the pressure : hook the spring in hole Ⓒ

Lubricate one or two drops of machine oil to rotating point or lubricate grease to sliding point.
Lubricate the respective parts listed below once every 1000 hours or once a year under normal conditions of use.
Avoid oiling then excessively, or rotation may become irregular because of oil splashes.

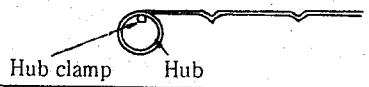
Lubrication point	Oil Grease
Motor shaft bearing	Oil
Capstan shaft bearing	Oil
Pinch roller shaft bearing	Oil

ADJUSTMENT OF SWITCHES

Name of switch	Action	Adjustment
Muting S11	This is interlocked with the head operating plate, preventing amp. sound except during recording and playback. 	For USA and Canada The contacts must be more than 0.5㎜ apart during recording and playback.  For General and Australia The contacts must be more than 0.5㎜ apart except during recording and playback. 
Rewind S12	Closed only during REWIND to operate Memory Counter	Contacts must be closed during rewinding and open at other times (bends by 1 to 3㎜)
Lamp S14	This interlocks with head operating plate during recording & playback and lights PLAY indicator	The contacts must be closed only during recording & playback, and open at other times. (bends by 1-3㎜) 
CrO_2 S15	This switch is used with CrO_2 cassettes (refer to page.....)	When the cassette does not have a CrO_2 detection hole, this must be turned ON. The gap between the switch & plate spring must be 0.2–0.6㎜. When a cassette with a CrO_2 detection hole is used, it should be turned OFF.

PRINCIPAL TROUBLE SHOOTING PROCEDURES

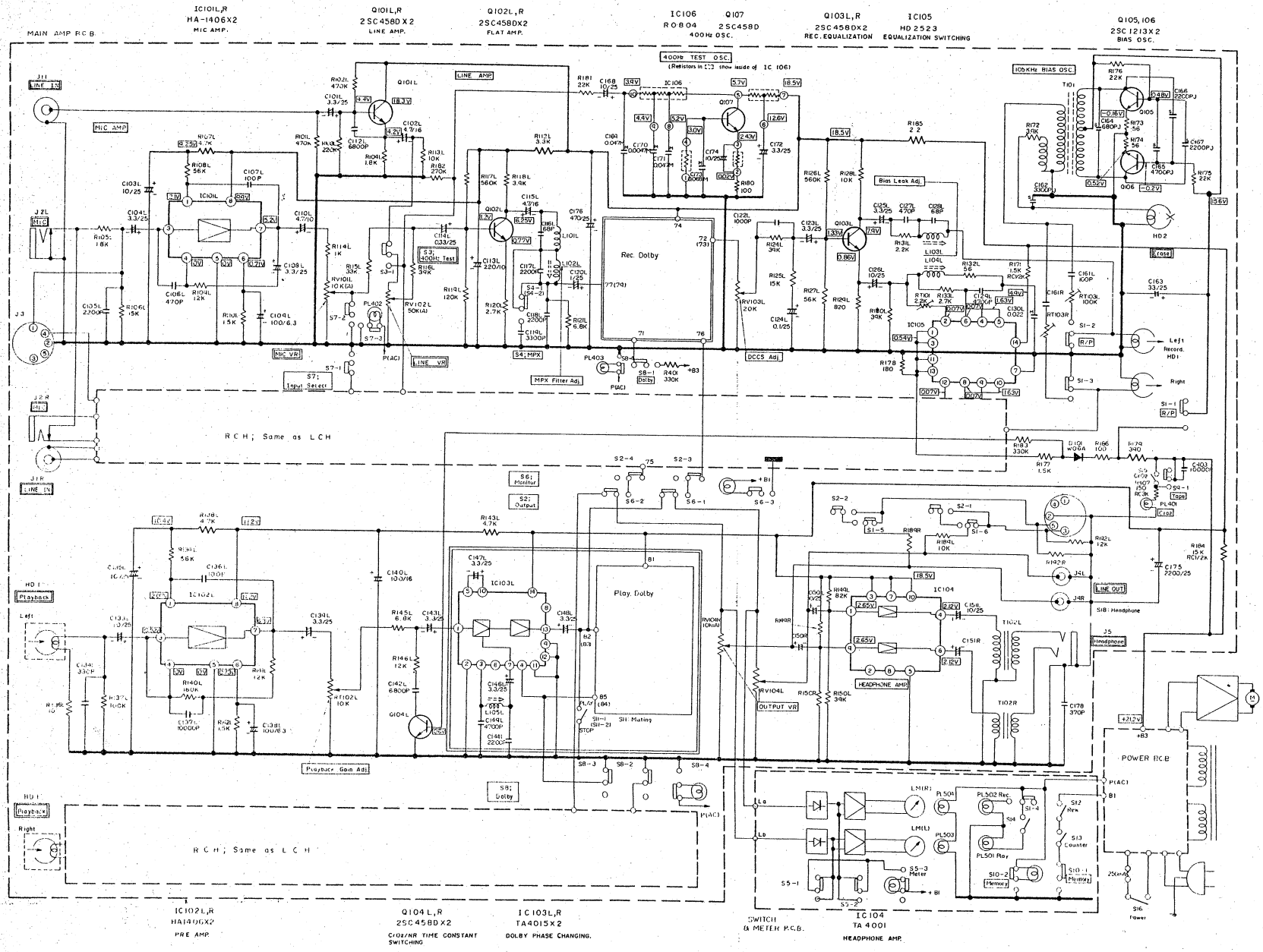
(Basic procedures are described in the Instruction Manual)

Malfunction	Possible cause	Solution
Large wow & flutter	Bad cassette	
	Back tension more than rated value, uneven back tension	Change cassette
	Tape deformed Misshapen Center hollow	Change cassette or cut out bad section of tape
	Improperly wound  Hub clamp Hub	Change cassette or do not use end of tape
	Wound unevenly	Fast forward, then rewind
	Height of R/P head badly adjusted	Adjust
	Wear or faulty pinch roller pressure	Change or adjust
	Dirt in drive section (belt, pulley, flywheel, turn table, etc.)	Clean
	Dirt in tape path (tape shifter, pinch roller, capstan, head)	Clean
Overall frequency characteristics poor	Tape selector position does not match cassette being used.	Change position of switch
	Poor adjustment of R/P head gate	Adjust
	Poor adjustment of recording bias	Adjust
Poor playback frequency characteristics	Poor azimuth adjustment of R/P head	Adjust
	Tape selector position does not match cassette being used.	Change position of switch
	Select switch in NORMAL position when Dolbyized tape is being played.	
Distortion too great	Position of tape selector does not match cassette used	Change switch position
	Recording input too high	Reduce level of input
	Poor adjustment of recording bias	Adjust

Malfunction	Possible cause	Solution
Sound level fluctuates	Cassette faulty (see "Wow & flutter")	As described in "Wow & flutter"
	Dirt on R/P heads	Clean
	Poor adjustment of R/P head gate	Adjust
Auto-stop does not operate	Defective auto-stop detection mechanism	Repair
	Lock-off piece worn	Change
Memory counter does not operate	Faulty contacts at tape counter	Change or repair
	Solenoid faulty or badly positioned Faulty circuit	Change or repair Repair
Dolby does not operate correctly	Faulty or badly adjusted	Repair or adjust
	Dolby ciruit	
	Faulty MPX filter	Repair
	Poor DCCS adjustment	Adjust
Faulty CrO_2 auto-changeover	Defective detector	Repair
	Plate spring position incorrect	Adjust
	Faulty micro-switch	Replace
Level meter incorrect	Faulty meter	Replace
	Meter circuit defective	Repair
	Amp. gain incorrectly adjusted	Adjust
No output sound	Output switch at OFF	Set to ON
	DCCS adjusting volume set at minimum during recording	Adjust

REPLACEMENT PARTS OF CAPACITORS, RESISTORS, SEMI-CONDUCTORS, TRANSFORMERS AND COILS.

SYMBOL-NO	P-NO	DESCRIPTION
		RESISTORS
RT101LR	0151884	VARIABLE 2,2KOHM B
RT102LR	0151886	VARIABLE 10KOHM B
RT103LR	0151889	SEMI VARIABLE 100K OHMB
RT201LR	0151871	SEMI VARIABLE 5KOHM
RT202LR	0151871	SEMI VARIABLE 5KOHM
RT301LR	0151871	SEMI VARIABLE 5KOHM
RT302LR	0151871	SEMI VARIABLE 5KOHM
RT401LR	0151861	SEMI VARIABLE 10KOHM
RT402LR	0151121	VARIABLE RV SASS 2K -B
RT403LR	0151861	SEMI VARIABLE 10KOHM
RV101LR	5026003	VARIABLE 10KOHM A
RV102LR	5026006	VARIABLE 50KOHM
RV103LR	5000151	VARIABLE 20K OHM B
RV104LR	5026003	VARIABLE 10KOHM A
		SEMI-CONDUCTORS
D101	5330341	DIODE SILICON W0-6A 60HZ 1,7W
D201LR	5330721	DIODE GERMANIUM 1N34A 10MHZ 50MW
D202LR	5330572	DIODE SILICON 1S2473HC 100MHZ 250MW 10NS
D203LR	5330572	DIODE SILICON 1S2473HC 100MHZ 250MW 10NS
D204LR	5330721	DIODE GERMANIUM 1N34A 10MHZ 50MW
D205LR	5330572	DIODE SILICON 1S2473HC 100MHZ 250MW 10NS
D301LR	5330721	DIODE GERMANIUM 1N34A 10MHZ 50MW
D302LR	5330572	DIODE SILICON 1S2473HC 100MHZ 250MW 10NS
D303LR	5330572	DIODE SILICON 1S2473HC 100MHZ 250MW 10NS
D304LR	5330721	DIODE GERMANIUM 1N34A 10MHZ 50MW
D305LR	5330572	DIODE SILICON 1S2473HC 100MHZ 250MW 10NS
D401LR	0575001	DIODE GERMANIUM 1N34A 10MHZ 50MW 140NS
D502	5330341	DIODE SILICON W0-6A 60HZ 1,7W
D503	5330341	DIODE SILICON W0-6A 60HZ 1,7W
D504	5330341	DIODE SILICON W0-6A 60HZ 1,7W
IC101LR	5350251	IC HA1406
IC102LR	5350251	IC HA1406
IC103LR	5356181	IC TA-4015
IC104	5356021	IC TA-4001
IC105	5359171	IC HD-2523P
IC106	5068042	IC
IC201LR	5350273	IC BA-301H-B
IC202LR	5356071	IC TA-4006
IC203	5356191	IC TA-4016
IC204LR	5068032	IC RD803A
IC302LR	5356071	IC TA-4006
IC304LR	5068031	IC RD-803
Q101LR	5320064	TRANSISTOR SILICON 2SC458D 230MHZ 200MW
Q102LR	5320064	TRANSISTOR SILICON 2SC458D 230MHZ 200MW
Q103LR	5320064	TRANSISTOR SILICON 2SC458D 230MHZ 200MW
Q104LR	5320064	TRANSISTOR SILICON 2SC458D 230MHZ 200MW
Q105	5320613	TRANSISTOR SILICON 2SC1213C 80MHZ 400MW
Q106	5320613	TRANSISTOR SILICON 2SC1213C 80MHZ 400MW
Q107	5320064	TRANSISTOR SILICON 2SC458D 230MHZ 200MW
Q201LR	5321221	TRANSISTOR SILICON 2SK40R-L
Q202LR	5320592	TRANSISTOR SILICON 2SA673B 80MHZ 400MW
Q203LR	5320064	TRANSISTOR SILICON 2SC458D 230MHZ 200MW
Q301LR	5321221	TRANSISTOR SILICON 2SK40R-L
Q302LR	5320592	TRANSISTOR SILICON 2SA673B 80MHZ 400MW
Q401LR	5320064	TRANSISTOR SILICON 2SC458D 230MHZ 200MW
Q402LR	5330572	TRANSISTOR SILICON 1S2473HC 100MHZ 250MW 10NS
Q501	5320671	TRANSISTOR SILICON 2SC1061B 5MHZ 50W
Q502	5320723	TRANSISTOR SILICON 2SA715C 150MHZ 10W
TH401LR	0576045	THERMISTOR D-28
ZD501	5330059	DIODE SILICON AW01-22 DC 1W
		TRANSFORMERS
PT	5211733	POWER 8,2VA,400G (BS)
PT	5211735	POWER 8,2VA,400G (S)
T101	5260022	OSCILLATOR COIL
T102LR	5250944	HEAD PHONE
		COILS
L101LR	5120185	TRAP 33MH
L102LR	5270001	VARIABLE 33MH
L103LR	5270001	VARIABLE 33MH
L104LR	5120274	CHOKE
L105LR	5270001	VARIABLE 33MH



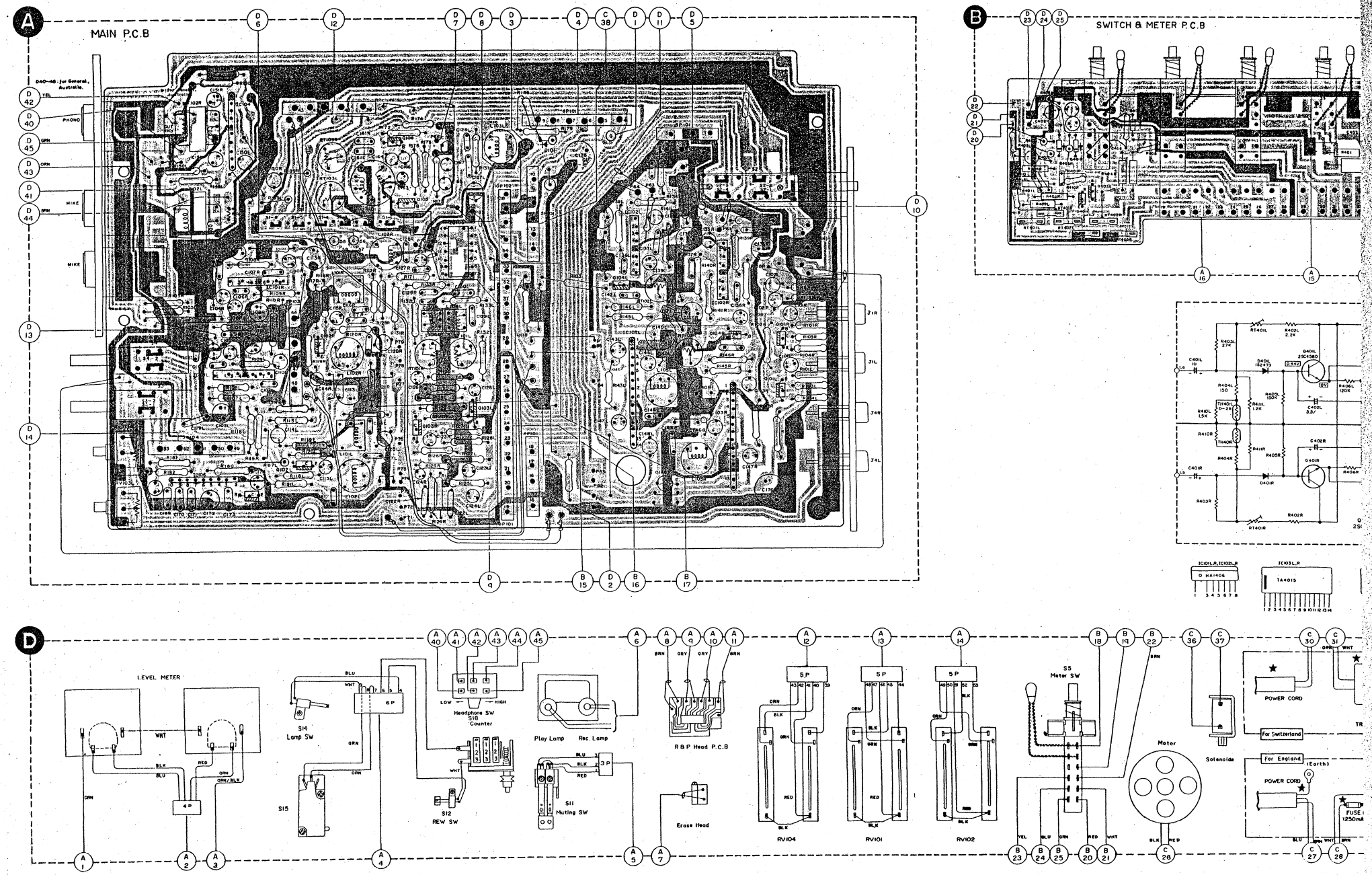
Note

1. Voltage measured at base of chassis with minimum volume control and no signal.
2. Nomenclature of Resistors and Capacitors.

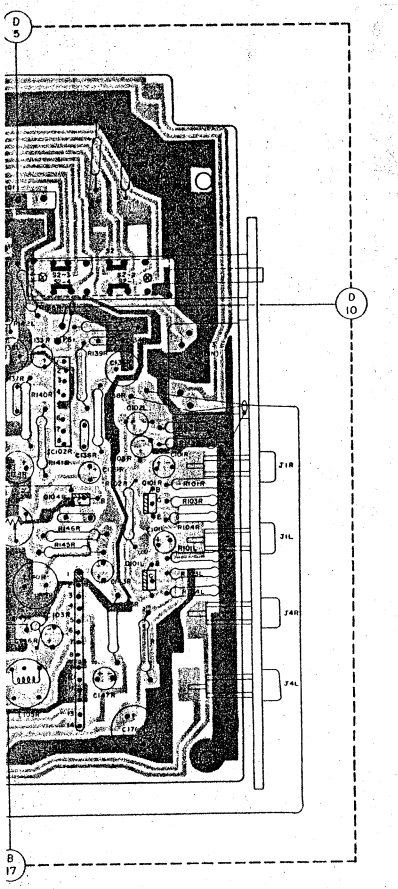
R101 150-RS-1-K-	Circuit No.
Value	No indicated Ω(Ohm) M : 1000kΩ
Tolerance	No indicated ±5% K : ±10% M : ±20%
Wattage	No indicated ¼W
Sort	No indicated Carbon film RC : Composition RW : Wire wound RS : Oxide metal film RN : Fixed metal film

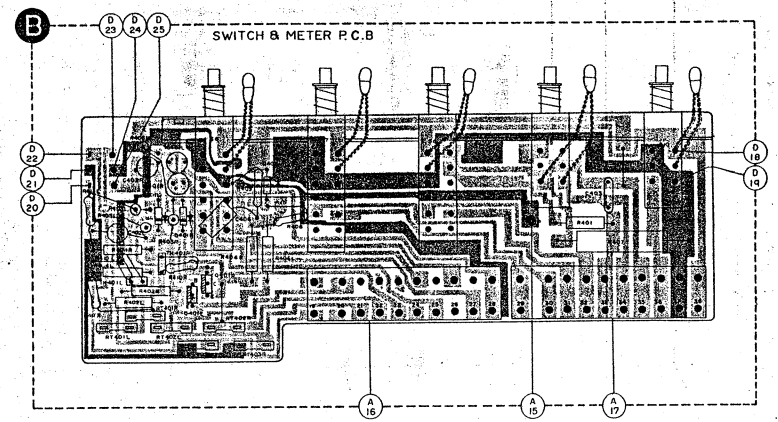
C101 0.001-M / C102 0.1/16-	Circuit No.
Value	No indicated μF P : PF
Tolerance	No indicated ±10% J : ± 5% M : ±20% Z : +80% -20% D : ±0.5pF C : ±0.25pF
Sort	Ceramic; Electrolitic; Mylar; Polyester; Styrol
Voltage	No indicated 50WV

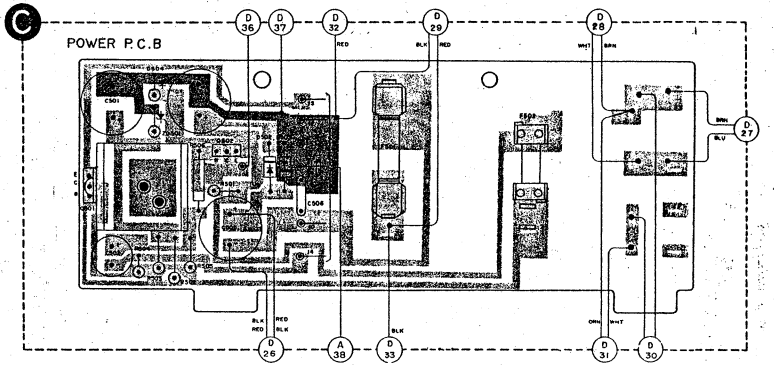
3. Be sure to make your orders of resistors and capacitors with value, voltage, tolerance and sort.
4. When replacing capacitors marked with ※, use specified ones stated on parts list since required temperature characteristics.

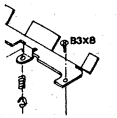

A
MAIN P.C.B
B
SWITCH & METER P.C.B
D
LEVEL METER
S14 Lamp SW
S15
S16 Counter
Headphone SW
S12 REW SW
S11 Muting SW
Play Lamp
Rec. Lamp
R & P Head P.C.B
Erase Head
RV104
RV101
RV102
S5 Meter SW
Motor
Solenoid
POWER CORD
For Switzerland
For England
(Earth)
FUSE 1250mA

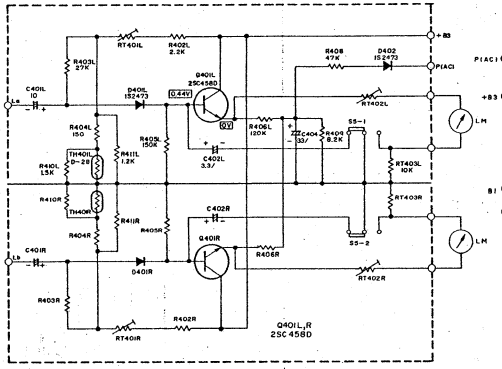
D-3500

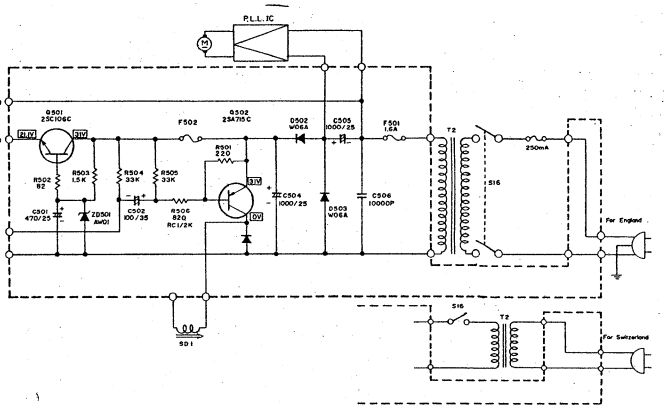


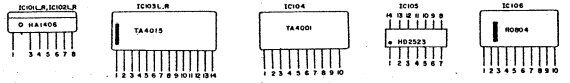












	Q101L,R	Q102L,R	Q103L,R	Q104L,R	Q105L,R	Q106L,R	Q107L,R	Q401L,R	Q501	Q502
E	4.2V	0.77V	0.86V	0V	-0.16V	0.52V	2.43V	0V	21.2V	31V
C	19.3V	6.25V	7.4V	—	15.6V	15.6V	5.7V	21.2V	31V	0V
B	4.4V	1.2V	1.33V	0.54V	0.48V	-0.2V	2.95V	0.44V	—	—

IC101L,R			
1	2.1V	5	0V
2	—	6	0.71V
3	0.6V	7	5.2V
4	0V	8	9.9V

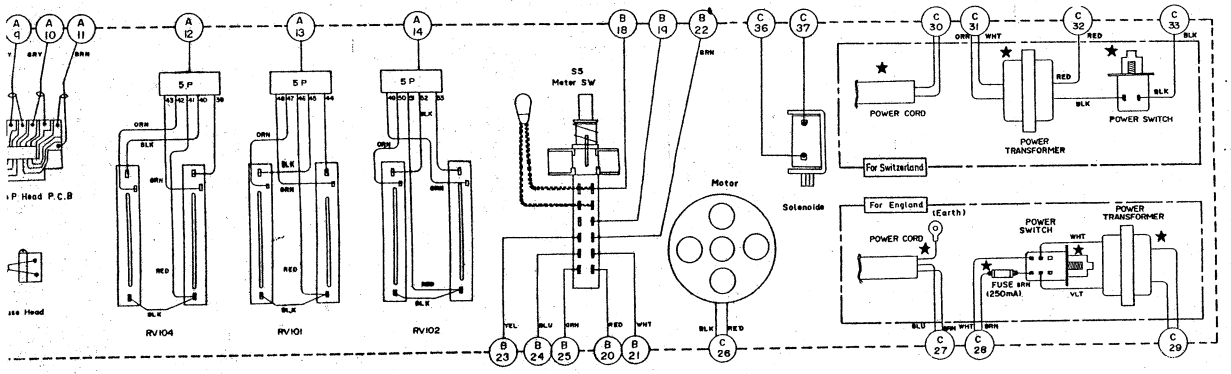
IC102L,R			
1	2.07V	5	0V
2	—	6	0.73V
3	0.52V	7	6.3V
4	0V	8	11.2V

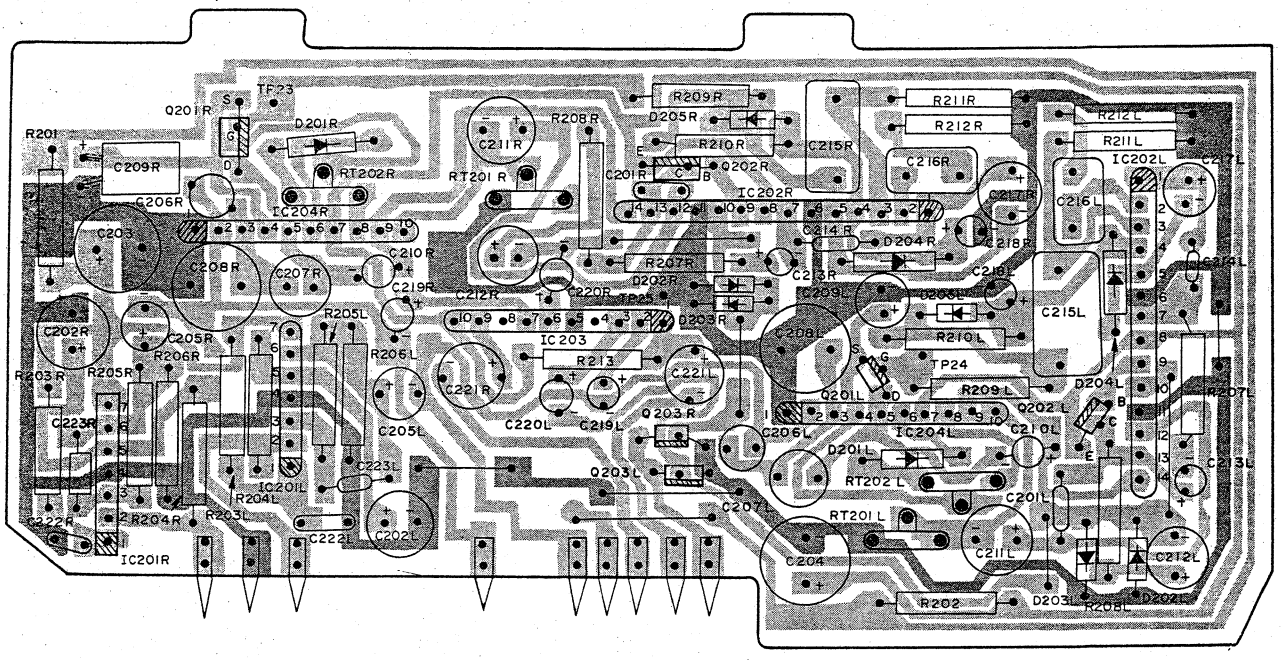
IC103L,R			
1	2.35V	8	8.8V
2	0V	9	0V
3	0V	10	0.58V
4	0V	11	0V
5	0V	12	0V
6	2.42V	13	8.2V
7	8V	14	19.3V

IC 104			
1	2.65 V	6	21.2V
2	2.5 V	7	18.5V
3	18.5 V	8	2.65V
4	2.1 V	9	2.65V
5	0V	10	16.5V

IC105			
1	0.54V	8	0.07V
2	0.07V	9	1.63V
3	0.54V	10	1.63V
4	1.63V	11	0.54V
5	1.63V	12	0.05V
6	0.07V	13	0.54V
7	0V	14	4.9V

IC 106			
1	0V	6	12.6V
2	0.02V	7	18.5V
3	2.45V	8	5.2V
4	2.95V	9	4.4V
5	5.7V	10	3.9V





IC201L,R	
1	2,17V
2	0,71V
3	0,17V
4	0V
5	0,9V
6	7,6V
7	14,3V

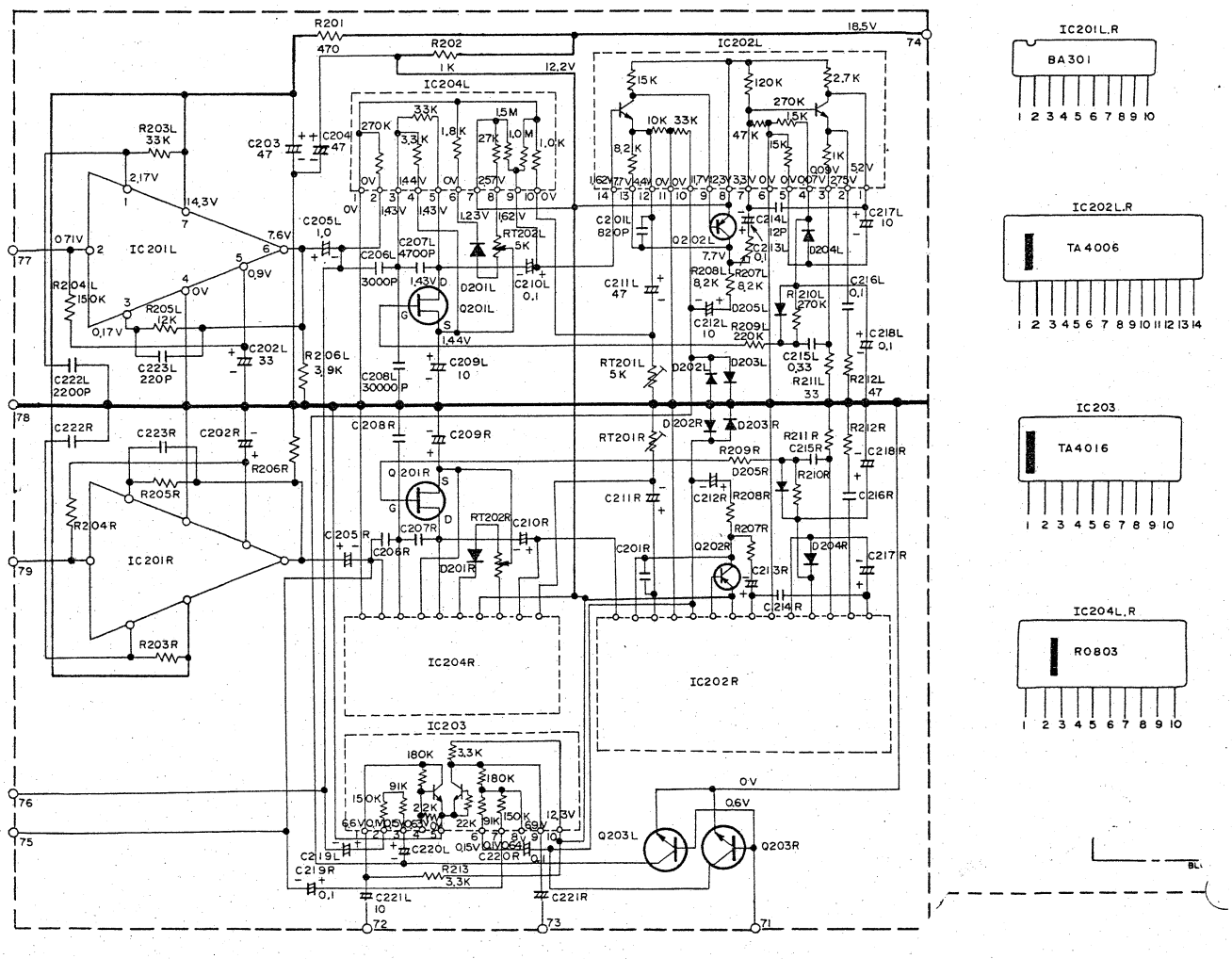
IC203			
1	6,6V	6	0,15V
2	0,1V	7	0,1V
3	0,15V	8	0,64V
4	0,63V	9	6,9V
5	0V	10	12,3V

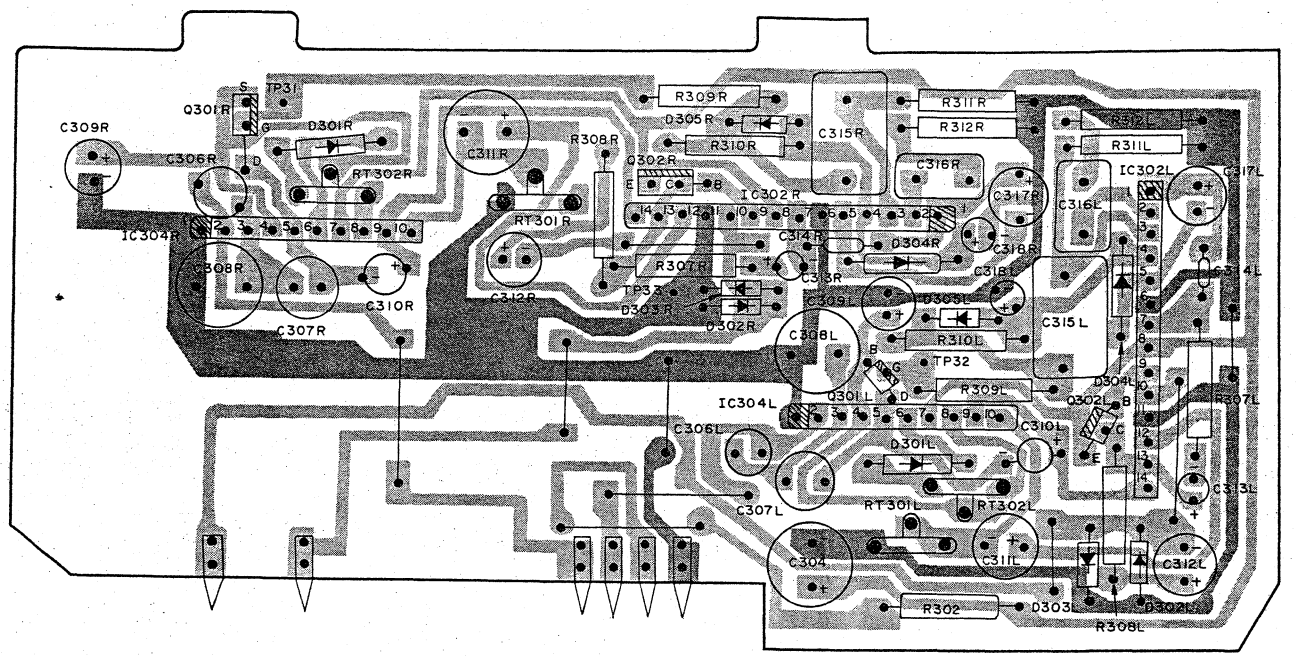
IC204L,R			
1	0V	6	0V
2	0V	7	12,3V
3	1,43V	8	2,75V
4	1,44V	9	1,62V
5	1,43V	10	0V

	Q202L,R	Q203L,R
B	11,7V	——
C	7,7V	0,6V
E	12,3V	0V

IC202L,R			
1	5,2V	8	12,3V
2	2,75V	9	11,7V
3	0,09V	10	0V
4	0,07V	11	0V
5	0V	12	4,4V
6	0V	13	7,7V
7	3,3V	14	1,62V

Q201L,R	
D	1,43V
S	1,44V
G	——



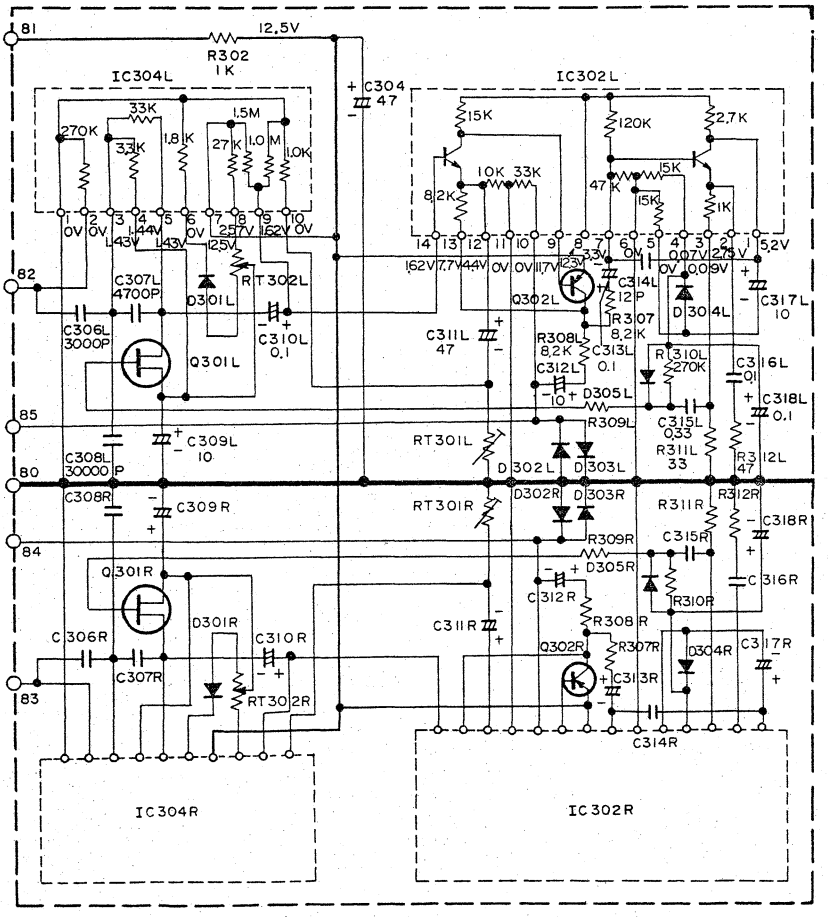


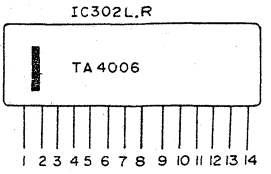
IC304L,R			
1	0V	6	0V
2	0V	7	12,5V
3	1,43V	8	2,57V
4	1,44V	9	1,62V
5	1,43V	10	0V

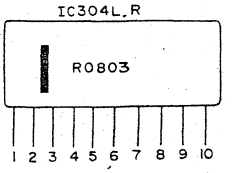
Q301L,R	
D	1,43V
S	1,44V
G	—

Q302	
B	11,7V
C	7,7V
E	12,3V

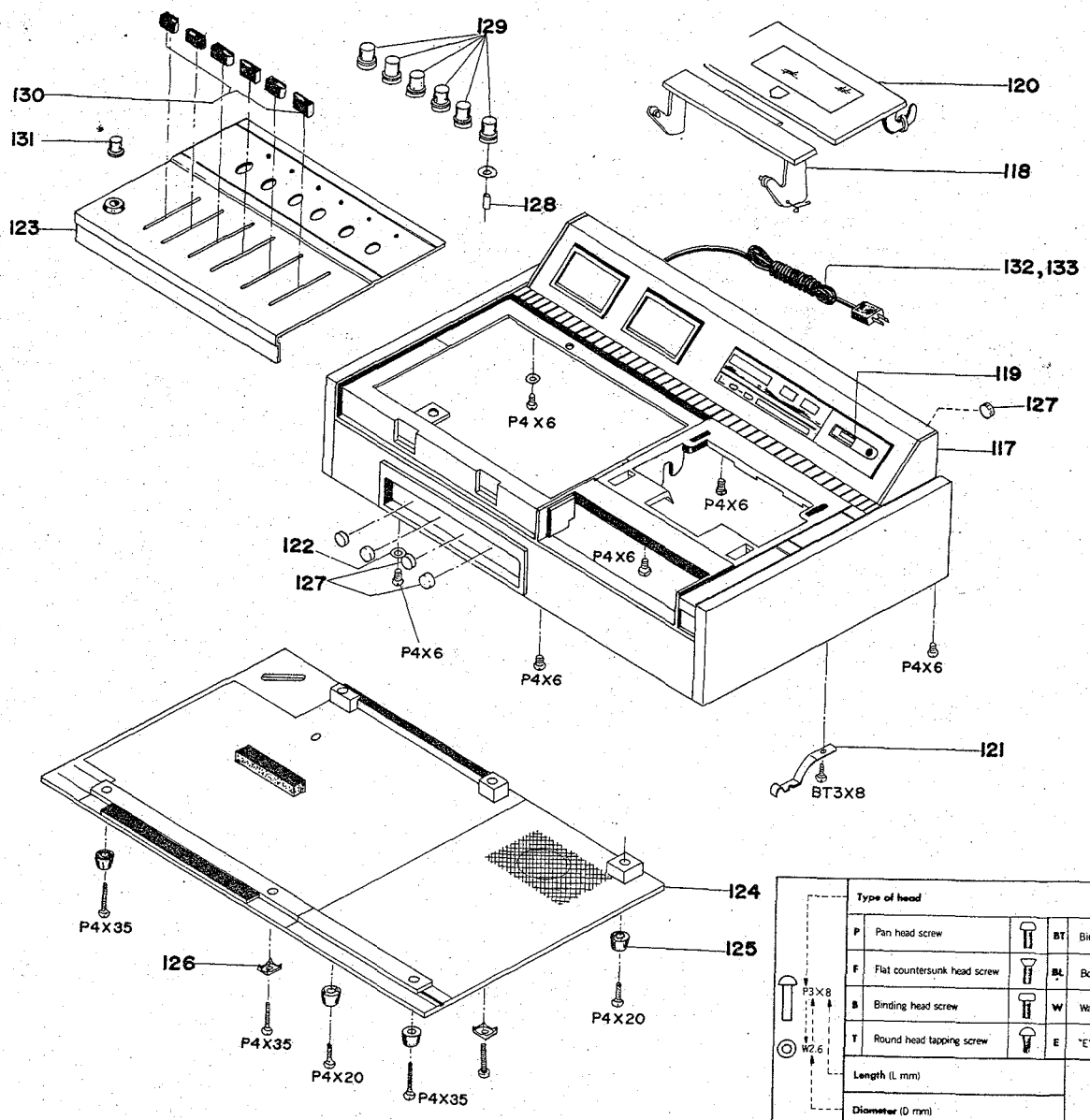
IC302L,R			
1	5,2V	8	12,3V
2	2,75V	9	11,7V
3	0,09V	10	0V
4	0,07V	11	0V
5	0V	12	4,4V
6	0V	13	7,7V
7	3,3V	14	1,62V







CABINET



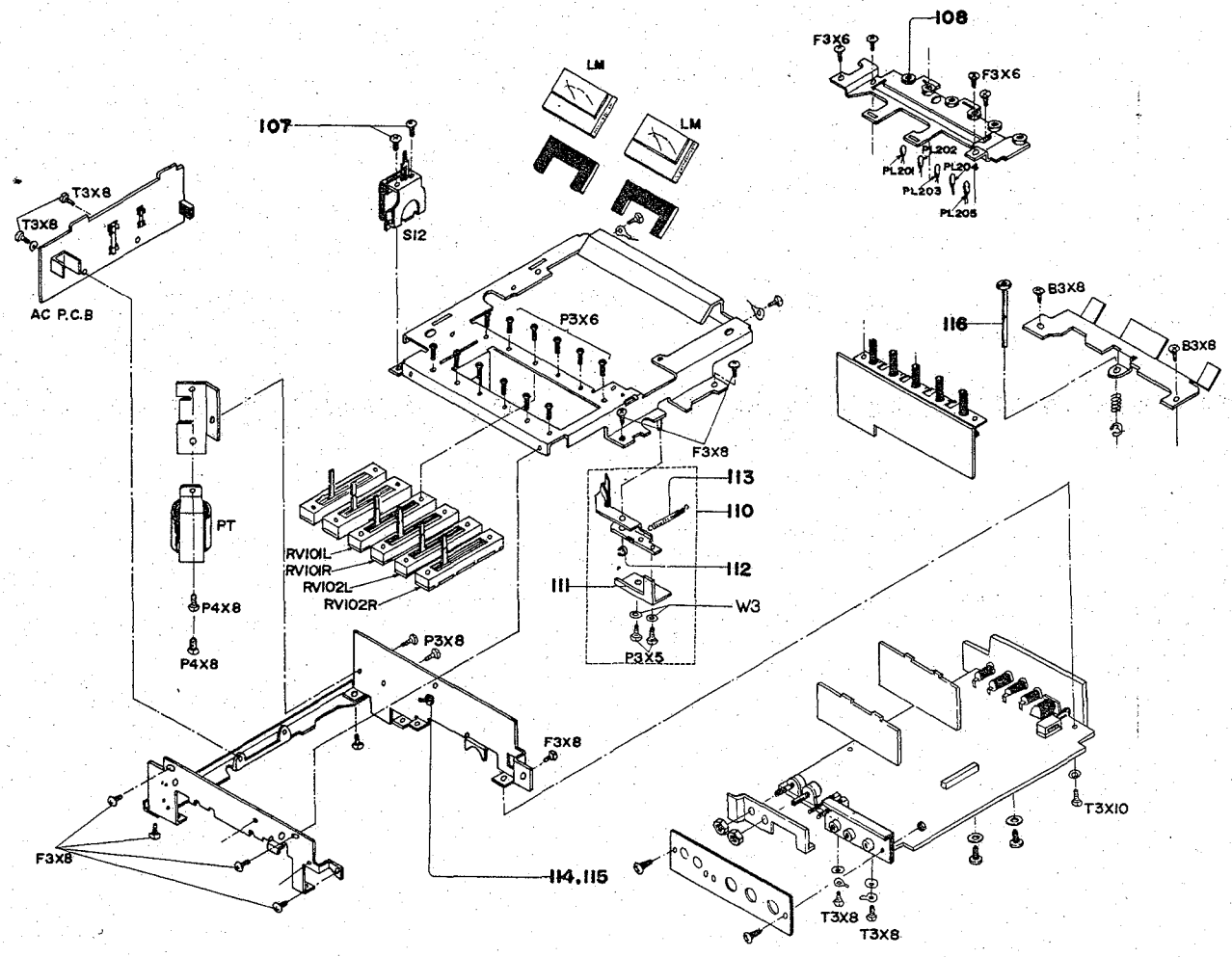
Type of head					
P	Pan head screw		BT	Binding head tapping screw	
F	Flat countersunk head screw		BL	Bolt	
B	Binding head screw		W	Washer	
T	Round head tapping screw		E	"E" ring	
Length (L mm)					
Diameter (D mm)					

P3X8, W2.6

When ordering hardware excluding stated on these lists, be sure to make your orders with type and size.

SYMBOL-NO	P-NO	DESCRIPTION
		MISCELLANEOUS
117	6134402	FRONT CASE ASS'Y
118	6095081	HEAD COVER
119	6218992	COUNTER BOARD ASS'Y
120	6090408	CASSETTE LID ASS'Y
121	6580082	RING FOR CASSETTE LID
122	7717704	SPECIAL WASHER
123	6670507	AMP PANEL ASSEMBLY
124	6155125	BOTTOM PLATE ASSEMBLY
125	6573011	RUBBER BASE
126	7191193	LOCK WASHER
127	6262182	KNOB
128	6258882	BUTTON BASE
129	6258984	SWITCH BUTTON ASSEMBLY
130	6295131	KNOB
131	6272468	PUSH BUTTON
132	5746154	POWER CORD (S)
133	5746291	POWER CORD ASS'Y (BS)
		FOR ACCESSORIES
	5744843	DIN CORD

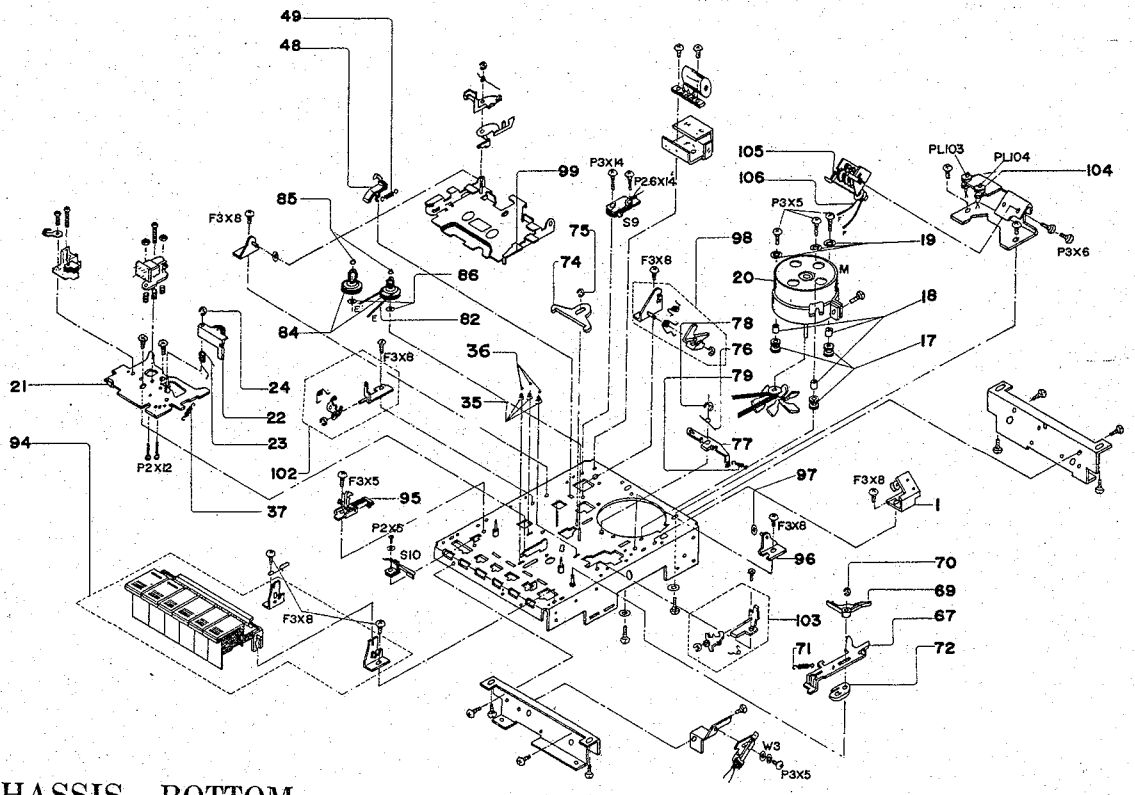
MAIN CHASSIS



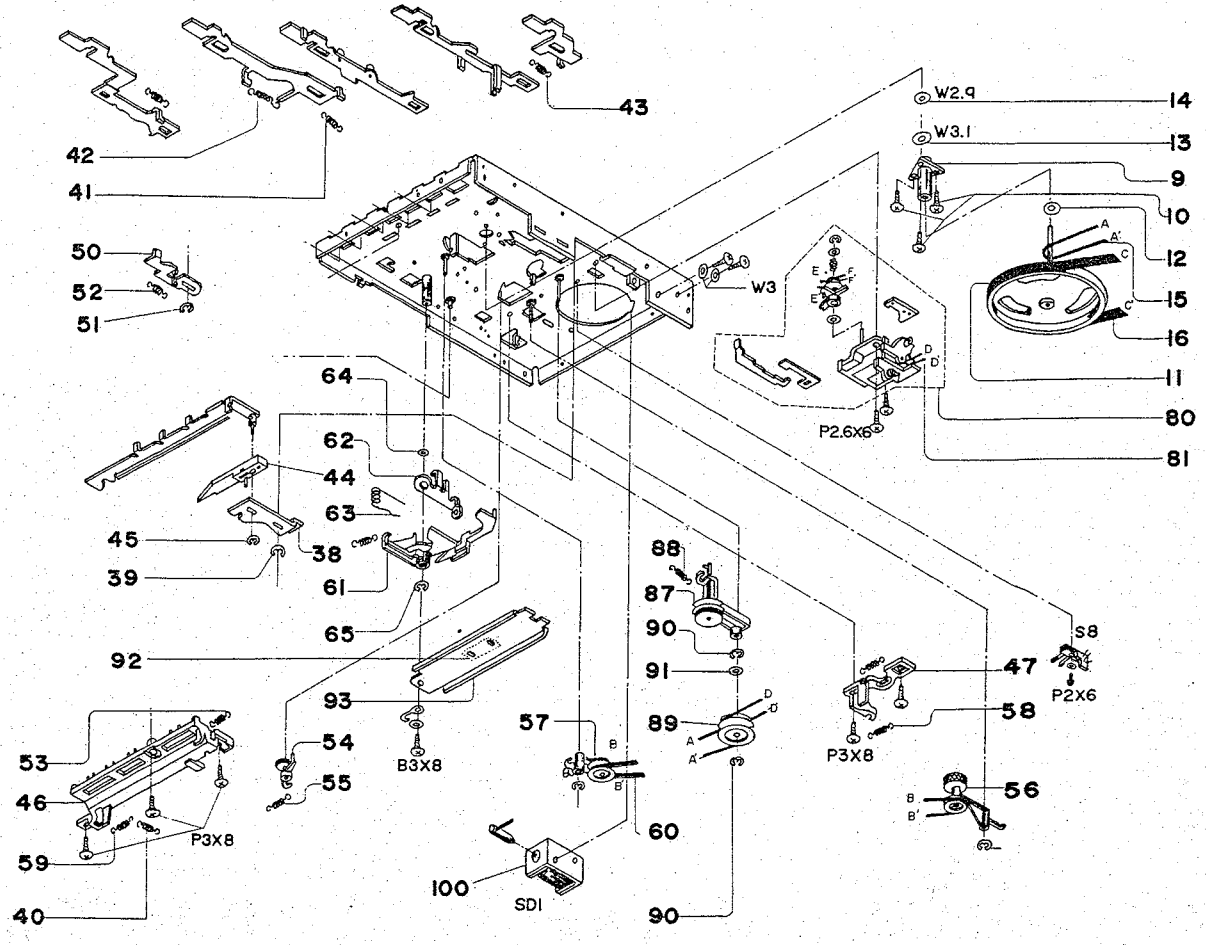
SYMBOL-NO	P-NO	DESCRIPTION
		FOR CASSETTE DECK ASSEMBLY(B)
107	7777618	SPECIAL SCREW MOUNTING
108	7667833	MOTOR RUBBER CUSHION
109	7777616	SPECIAL SCREW
110	7271688	REC, LEVER ASS'Y
111	7271702	REC, LEVER
112	7230903	E RING - 4MM0
113	6324451	BRAKE FUNCTION PLATE SPRING
114	0043793	BUSHING NYLON (S)
115	6794011	BUSHING (BS)
116	7539101	STUD ASS'Y
		MISCELLANEOUS
F501	5721061	FUSE 1,6A
F502	5720171	FUSE (BS)
J1LR	5676092	PIN JACK
J2LR	5679181	JACK
J 3	5651141	5P DIN SOCKET
J4LR	5676092	PIN JACK

SYMBOL-NO	P-NO	DESCRIPTION
J 5	5679181	JACK
L M	5554103	LEVEL INDCATOR
PL401-406	5762142	LAMP
PL501	5762172	LAMP
PL502	5762171	LAMP
S 5	5637039	PUSH SWITCH
S 6	5637036	PUSH SWITCH
S 7	5637036	PUSH SWITCH
S 8	5637036	PUSH SWITCH
S 9	5637036	PUSH SWITCH
S 1	5623112	SLIDE SWITCH
S10	5637036	PUSH SWITCH
S11	5632173	LEAF SWITCH
S16	5632672	POWER SWITCH (BS)
S16	5633022	POWER SWITCH (S)
S18	5621303	SLIDE SWITCH ALARM ON/OFF
S 2	5630903	PUSH SWITCH
S 3	5633164	PUSH SWITCH
S 4	5633161	PUSH SWITCH

CHASSIS – TOP

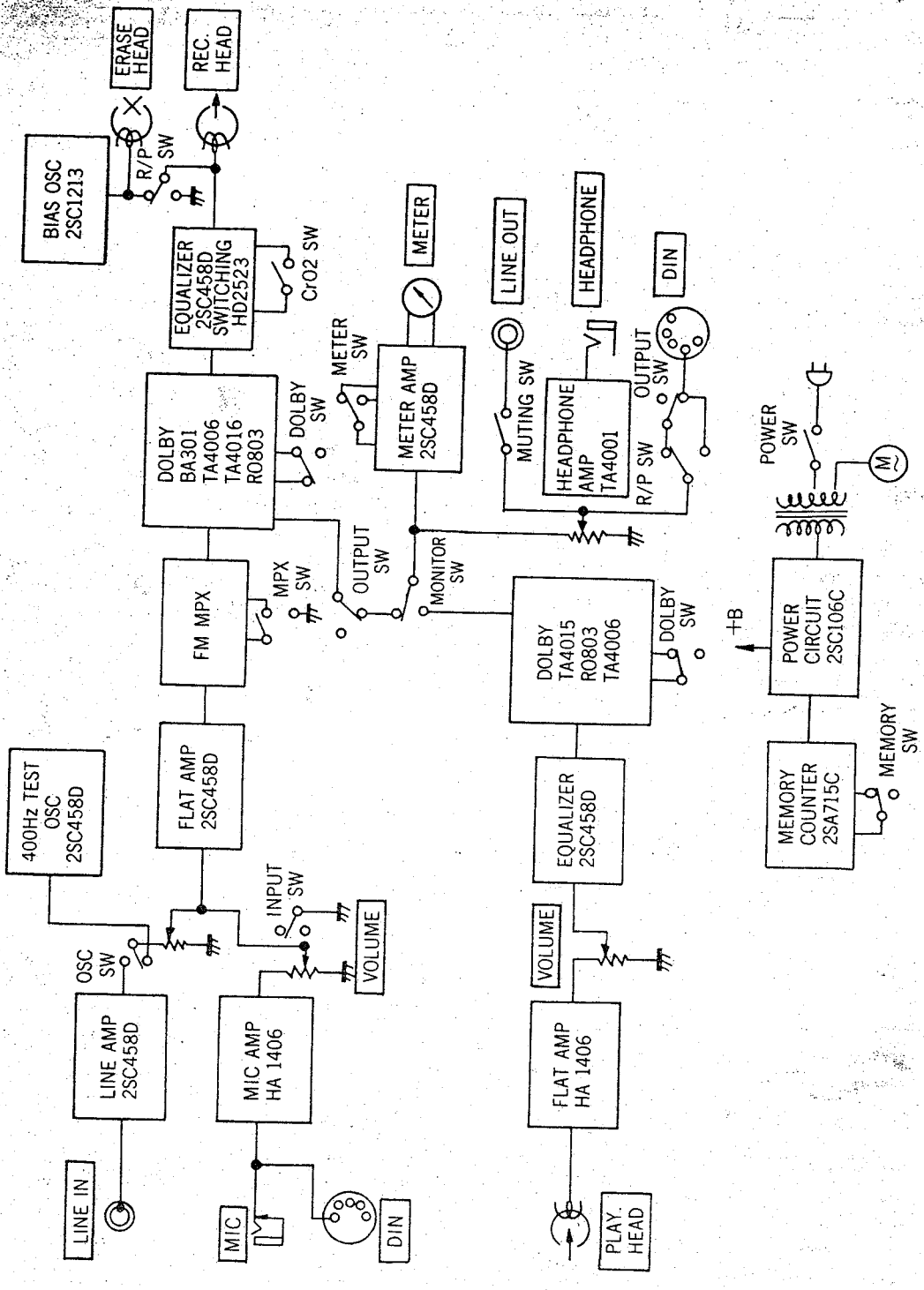


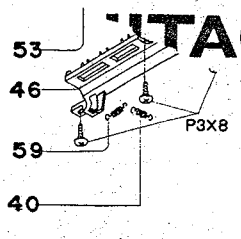
CHASSIS – BOTTOM



FOR CASSETTE DECK ASSEMBLY(A)

SYMBOL-NO	P-NO	DESCRIPTION
1	7465271	ROLLER HOLDER ASS'Y
2	7740243	PAD FELT
3	7540152	PADPIN ASSEMBLY
4	0711306	PAN HEAD SCREW-2,6MMDX6MM
5	5526271	SWITCH P,C,B ASS'Y
6	5630562	PLATE SWITCH PAUSE
7	5631821	SWITCH-MICRO
8	0711314	PAN HEAD SCREW-2,6MMDX4MM
9	7592581	METAL HOLDER ASS'Y
10	7780822	PAN HEAD SCREW 2,6X4 MM
11	6372283	FLYWHEEL ASSEMBLY
12	7771761	POLYESTER WASHER
13	7779812	WASHER - 3,1MMD
14	7771913	WASHER - 2,9MMD
15	6354161	BELT
16	6357054	BELT
17	6576161	MOTOR CUSHION
18	7574403	COLLAR
19	0645587	SPECIAL WASHER
20	5572322	MOTOR WITH PULLEY
21	7270535	HEAD PLATE ASSEMBLY
22	7252992	PRESSURE ROLLER ARM ASSEMBLY
23	6306921	SPRING
24	7230901	E RING
25	5444132	HEAD
26	6303952	HEAD SPRING
27	5445011	ERASE HEAD
28	7491681	ERASE HEAD PLATE ASSEMBLY
29	6738861	TAPE GUIDE
30	7282413	EARTH PLATE STOPER
31	6303272	PLATE SPRING
32	6300083	SPRING
33	8650904	SCREW WITH SPRING WASHER-2,6MMDX4MM D
34	7786361	WASHER
35	6303961	SPRING
36	0948492	BALL - 2MMD
37	6300351	SPRING
38	7270571	LOCK OFF SLIDER
39	7230901	E RING
40	6300142	SPRING
41	6322051	SPRING
42	6323801	SPRING
43	6321661	RECORDING FUNCTION PLATE SPRING
44	6733891	LOCK OFF PIECE
45	7230901	E RING
46	6733953	HOLDER PLATE A
47	6733961	HOLDER PLATE B
48	6733922	RECORDING PREVENTION PLATE
49	6300142	SPRING
50	7270444	EJECT PLATE
51	7230902	E RING
52	6300142	SPRING
53	6323063	SPRING
54	6733501	REWINDING IDLER ASS'Y
55	6325853	SPRING
56	6733482	FAST FORWARD ARM ASSEMBLY
57	6411623	F ARM ASSEMBLY
58	6320071	FUNCTION PLATE SPRING
59	6322051	SPRING
60	6354171	FR BELT
61	6733981	FR LEVER
62	7273092	RECORDING STOPER
63	6307043	SPRING
64	7778433	POLYESTER WASHER
65	7230903	E RING - 4MMD
66	6300351	SPRING
67	7270637	PAUSE SLIDER ASSEMBLY
68	0948727	WASHER-NYLON WASHER
69	6733932	PAUSE LEVER
70	7230902	E RING
71	6322801	RETURN SPRING
72	6725701	PAUSE LOCK PIECE
73	0020784	POLYSTYOL WASHER
74	6733991	BRAKE PLATE
75	7230902	E RING
76	6307162	SPRING
77	7275261	LINK LEVER
78	7230903	E RING - 4MMD
79	6321281	SPRING
80	6411696	AUTO STOP BLOCK ASSY
81	6354121	BLOCK BELT
82	6354151	TT BELT
83	0711306	PAN HEAD SCREW-2,6MMDX6MM
84	6411701	TURN TABLE ASS'Y
85	0930002	CAP
86	0948831	POLYESTER WASHER TURNTABLE MOUNTING
87	6411633	TAKE UP ARM ASS'Y
88	6300171	SPRING
89	6349032	T PULLEY ASS'Y
90	7778394	E RING 1,5MMD
91	0948832	POLYESTER WASHER
92	6733941	CAPSTAN HOLDER
93	7270582	FLYWHEEL HOLDER
94	6255183	MD BUTTON ASS'Y
95	6733913	EJECT ASSEMBLY
96	7270552	TRAY HOLDER ASS'Y
97	0948727	WASHER-NYLON WASHER
98	7274271	TRAY ARM ASS'Y
99	7271051	CASSETTE TRAY ASS'Y
100	5642082	DC SOLENOID
101	7777183	HEXAGONAL SCREW - 3MMD X 6MM
102	7274261	SIDE ARM ASSEMBLY
103	7274262	SIDE ARM ASSEMBLY
104	7667833	MOTOR RUBBER CUSHION
105	5559041	MEMORY COUNTER ASSEMBLY
106	6354181	COUNTER BELT





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